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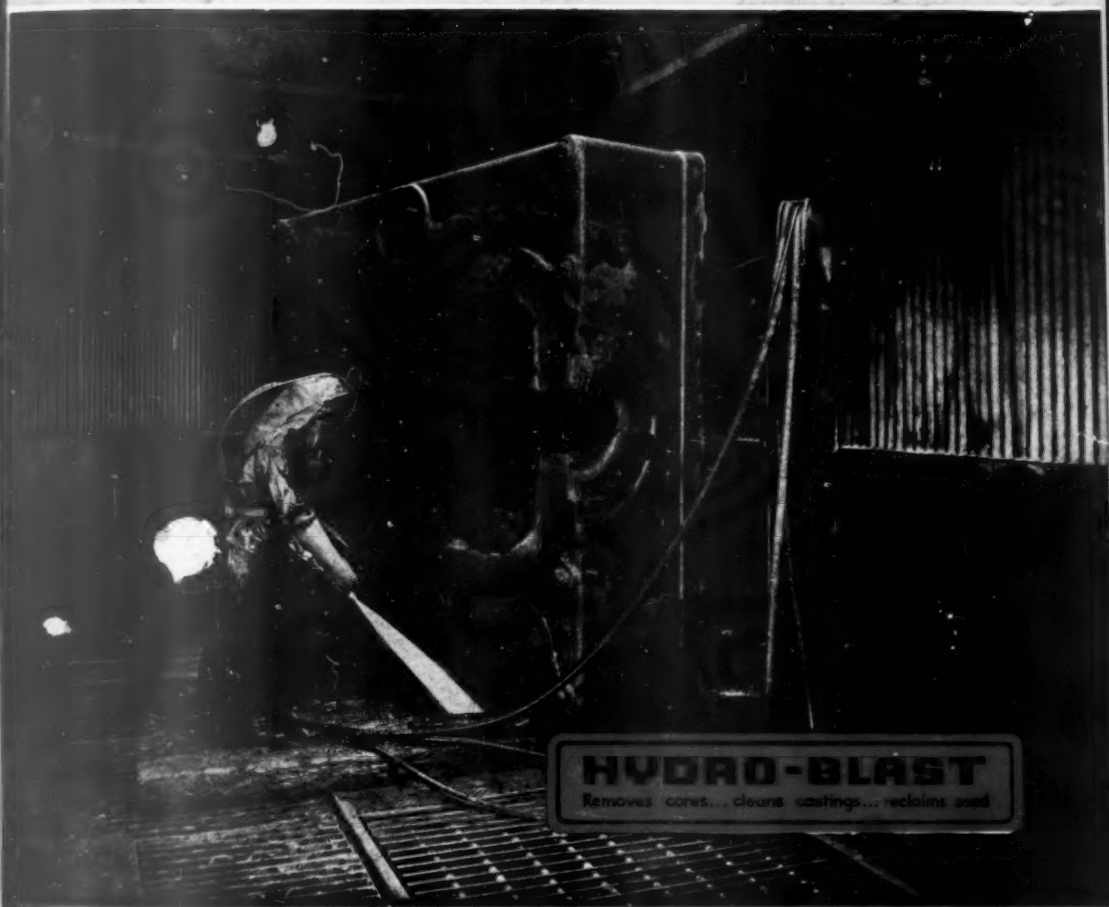

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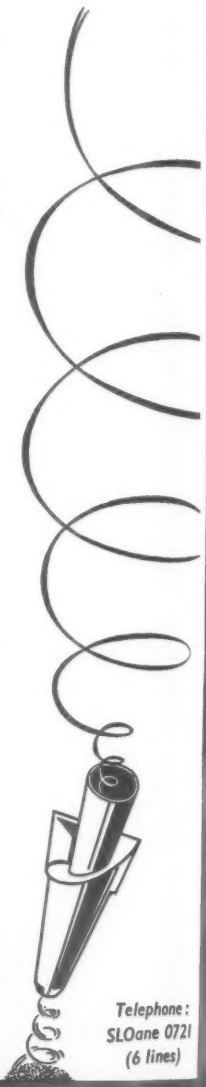

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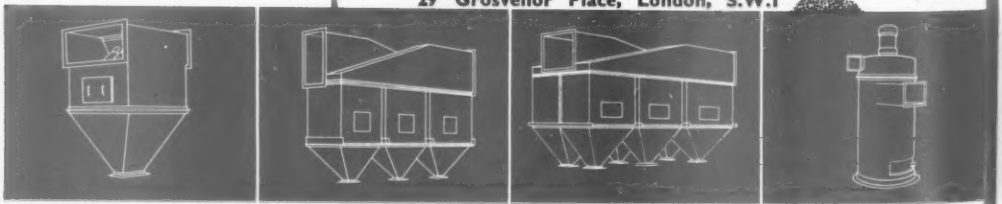

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Co-operation for Service

One of the great advantages of this country is the relatively short distances between manufacturing centres, and should a component be required urgently it can be put on a passenger train or sent by lorry, in response to a telephone call. It is perhaps this knowledge that has led to insufficient attention being given to the supply of spare parts. During the last war, and without conscious effort, a Midland foundry found themselves becoming a useful source of supply for spare parts for shot-blast plants; no doubt other cases could be cited. Shortly after the war, we participated in negotiations which resulted in the sale of an alloy at a uniform price to the merchants, but a local stockholder was paid a rent for his storage and handling facilities. Applying the example of the two unrelated happenings cited above to the furnishing of spare parts by the foundry-equipment manufacturers to the various foundry centres, the following suggestions are made: Where several installations of plant or machinery are made in one area, arrangements should be concluded between the supplier and a founder using the equipment to carry a stock of spare parts, against a small annual space rental. Then, in agreement with the stockholder, a letter would be sent to all neighbouring users of such equipment notifying them that urgently needed spare parts were locally available. The provision of a few stamped/addressed postcards on which to advise the manufacturer of any withdrawals from the local stock would eliminate the risk of wrong invoicing and involve the stockholders in a minimum of trouble.

Whilst this system would not entirely obviate the urgent trunk calls and the despatch of a replacement part by passenger train, it would be of advantage in the main foundry centres. The larger foundry-equipment firms have already organized the numbering and coding of spare-parts to facilitate correspondence and ease of identification. Thus, a detachable postcard joined in some way to each component and carrying the identification number would again minimize clerical work at the stockholders' end. Nothing is more distressing to a foundry concern to have production held up because of the absence of a spare part and any effort made by the manufacturers of equipment either by the method suggested, or some other system, would be appreciated by the industry at large. With the system we have outlined, there would be engendered a comfortable feeling amongst users that spare parts were available locally and not a hundred or more miles away.

Similar co-operation can be effected by the supplies concerns, and an instance is the supply of liquid oxygen and core-oil in bulk. The attachment of radio telephone facilities to lorries is a further means of providing additional customer service. Too much thought cannot be given to co-operation with customers for mutual benefit.

R.S.A. Endowed Prizes, 1955

The Royal Society of Arts, as trustee for the undermentioned endowments, offers the following prizes during the year 1955:—

Howard Prize of £50 for Mechanical Motive Power

The Howard Trust was established in 1868 for the purpose of making awards periodically to the authors of treatises on steam or other motive agents, and a prize of £50 will be awarded to the author of a treatise on some aspect of the subject of mechanical motive power.

Benjamin Shaw Prize of £20 for Industrial Safety

The Benjamin Shaw Trust was founded in 1876 "for the promotion of improvements in all matters relating to unhealthy or dangerous occupations," a subject in which the Royal Society of Arts has taken a practical interest ever since its foundation in 1754. A prize of £20 is offered in accordance with the terms of the Trust "for any discovery, invention, or newly-devised method of obviating, or materially diminishing any risk to life, limb or health, incidental to any industrial occupation, and not previously capable of being so obviated or diminished by any known and practically available means." Entries may be in the form of descriptive essays or models.

Fothergill Prize of £20 for Fire Prevention or Fire-fighting

Under the Fothergill Trust (established by the Will of Dr. Fothergill in 1821) a prize of £20 is offered for a descriptive essay or model embodying some new idea for the prevention or suppression of fire.

General conditions of entry may be obtained from the secretary of the Royal Society of Arts, 6/8 John Adam Street, Adelphi, London, W.C.2, and entries must be received not later than July 31, 1955.

Vitreous Enamellers' Summer School

Applications are now invited for places at the Institute of Vitreous Enamellers' "Summer School of Vitreous Enamelling" to be held at Ashorne Hill, near Leamington Spa, from mid-day on Friday, March 11, until the following Sunday morning. The programme includes a visit to Fisher & Ludlow, Limited, Birmingham. Full details are available from the secretary, Mr. J. D. Gardom, John Gardom & Company, Ripley, Derbyshire.

On the first day, after the works visit and dinner, there is an evening session at which Mr. W. E. Charles is to present his Paper "Enamelling of Precious Metals."

On Saturday, five papers are to be presented: "Modern Techniques in Vitreous-enamelling Sheet Iron" by J. J. Guy; "Safety Factors in Vitreous-enamelling Plants" by Bramley Harker (Chief Safety Officer, Birmingham Division); "Modern Techniques of Enamelling Cast Iron" by A. K. Williams; "Vitreous Enamelling of Signs" by L. E. Malec, and "Development of Steel Production for the Vitreous-enamelling Industry" by F. Smith. Finally, there is to be an address by the president, Sir George Briggs. On Sunday morning, the delegates disperse.

Latest Foundry Statistics

According to the Council of Ironfoundry Associations 142,751 people were employed in the United Kingdom during the week ending January 1, 1955. The corresponding earlier figures were for the week ending November 27, 1954, 141,398 and for January 2, 1954. 141,220.

New A.F.S. Officers and Directors

At the annual meeting of the 1954-55 nominating committee of the American Foundrymen's Society, Mr. Bruce L. Simpson, president of National Engineering, Company, Chicago, was nominated president for the year 1955-56, and Mr. Frank W. Shipley, foundry manager of Caterpillar Tractor Company, Peoria, Ill., for the office of vice-president.

In addition, six new national directors were nominated for three-year terms (1955-58):—Mr. Curtis C. Drake, plant superintendent, Griffin Wheel Company, Denver, Colo.; Mr. Robert W. Trimble, foundry superintendent, Bethlehem Supply Company, Tulsa, Okla., and Mr. C. W. Gilchrist, foundry superintendent, Cooper-Bessemer Corporation, Mt. Vernon, Ohio (all representing grey-iron interests); Mr. O. J. Myers, technical director, Foundry Products Division, Archer-Daniels-Midland Company, Minneapolis, Minn. (representing supplies); Mr. Charles E. Nelson, technical director, Magnesium Division, Dow Chemical Company, Midland, Mich. (representing light metals) and Mr. Richard A. Oster, director, Beloit Vocation and Adult School, Beloit, Wis. (education). New officers and directors will be elected and installed during the 59th annual AFS Foundry Congress, to be held this year in Houston, Texas, from May 23 to 27.

Valve-tappet Machining

Automatic production of cast-iron valve tappets, straight from the foundry, has been developed in transfer lines by Arthur Scrivener, Limited, Tyburn Road, Birmingham. A number of installations have been supplied or are on order for the automatic grinding of tappets 2¼ in. long by ⅞ in. dia., direct from the foundry, to limits of ±0.00025 in. The installation is a somewhat unusual one, and embodies the following units: (1) automatic hopper (2) centralized control (3) conveyor line carrying the pieces from the hopper through three successive grinding throats, and (4) a push-button micro-sizing device, whereby the adjustment of the grinding wheel at any of the three stages can be immediately effected. The normal production of this transfer unit is 850 tappets per hour, to the limits of accuracy quoted.

National Society of Master Patternmakers

At the approach of the successful completion of its first year, the National Society of Master Patternmakers is planning a short conference in London on Friday, May 6, to include the annual general meeting in the afternoon, and a dinner/dance and cabaret in the evening. The dinner and entertainment will be held at the Café Royal, Regent Street, London. Members are cordially invited to bring their ladies and any number of guests. It is estimated that the cost of the dinner/dance and cabaret will be around £2 10s. per head, but full details will be available later. Members are advised to make immediate reservations for tickets with the secretaries (Mann, Judd & Company, 8, Frederick's Place, Old Jewry, London, E.C.2) and book hotel accommodation in London.

A RESIDENTIAL COURSE for Training Officers is to be held at the Prospect Hotel, Harrogate, from Sunday evening, March 6, until Friday afternoon, March 11. Details are available from the Industrial Welfare Society, 48, Bryanston Square, London, W.1.

Another Look at "Expansion"-type Scabs

*By Douglas C. Williams**

This article is primarily intended for those who are willing to become involved in an adventure in thinking. A ready-made answer to the problem will not be forthcoming unless the foundryman wishes to adventure with his thoughts. Much progress in the foundry industry has been accomplished in, say, materials handling, but it may be asked what advances the foundry industry has fostered that have made it possible to recognize and applaud thinking. Is an imaginatively thinking employee an asset or a liability? Can a supervisor or a manager be successful if he fails to recognize and make use of creative thinking by employees? Does the elimination of the "expansion" scab defect rest with a man's present knowledge or is he willing to adventure with new lines of thinking, one of which will be presented herein?

There seems to be no clear-cut explanation for the "expansion"-type scab in the literature. In order to demonstrate the variety of causes said to contribute to formation of this defect some literature references follow:—

1912—*Elementary Foundry Practice*, W. A. Richards, The MacMillan Company, page 94. "When small patches of mould face wash or fall off, projections like warts are left on the surface of the casting which are called scabs. The cause is moisture brought to the surface by too much sleeking. This moisture, drying out by the heat of molten metal, allows the skin to flake."

1929—*Foundryman's Handbook*—Penton Publishing Company, page 489. "The constituents of cast metals under certain conditions may react chemically with the sand of the mould to form a dirty, slaggy crust on the surface of the casting which is called a scab. This may be due to many things such as temperature of the metal, refractoriness of the sand, condition of the facing, etc."

1930—*Principles of Iron Founding*—R. Moldenke, McGraw-Hill, page 552, "Imperfection in the surface of the casting due to breaking away of portion of the mould by the stream of molten metal."

1931—*Natural Bonded and Synthetic Sands in Steel Founding*—H. J. Cole, *Trans.* American Foundrymen's Association, vol. 39, page 167, "If these gases cannot escape through the sand forming the mould, then the mould surface, through rise in pressure, is either pushed away causing a scab. . . ."

1933—*Commercial Moulding Sand Control for the Ironfounder*—F. Hudson, FOUNDRY TRADE JOURNAL, December 28, page 372. "Expansion of silica occurs between 500 and 700 deg. C. It is feasible to expect that this expansion leads to a slight buckle which has a marked similarity to the 'blind scab.'" Note—this was the earliest reference found which related expansion of silica to scab formation.

1934—Discussion of paper by F. Hudson, FOUNDRY TRADE JOURNAL, February 22, page 136. One contributor points out that increased moisture content in sand mixtures reduces the possibility of scab formation.

1935—(1) *Expansion and Contraction of Moulding Sand*—H. W. Dietert and F. Valtier—*Trans.* A.F.A. vol. 44, page 114. "This combination of excessive expansion and contraction as obtained when sufficient weight of molten metal is present to raise the temperature of the sand to the contraction point is undoubtedly the best explanation of the direct cause of a 'scab.'"

(2) *Procedure for Analysis of Defects—Trans.* A.F.A. vol. 43, page 248. "Cause: Too heavy ramming may result in scabs because the mould face is so dense as not to have room for expansion when exposed to heat of metal."

(3) *Defects in Iron Castings: Their Causes and Cures*—B. Tyrie, FOUNDRY TRADE JOURNAL, January 17, page 59. "Scabbing in green sand may arise from sand being too wet, mould rammed too hard or insufficient venting. In dry-sand work, scabs are almost always due to insufficient venting."

(4) *Commercial Moulding Sand Control for the Tyneside Founder*—F. Hudson, FOUNDRY TRADE JOURNAL, April 18, page 263. "It has been found that the expansion of moulding sands can cause casting defects such as blind scabs."

(5) *Castings*—W. Machin and M. C. Oldham, FOUNDRY TRADE JOURNAL, October 24, page 317. "On moulds or cores, due to moisture bad vents or faulty sand, scabs can occur on castings."

1937—*Further Developments with Coal-dust in Moulding Sand*—Ben Hird—FOUNDRY TRADE JOURNAL, March 4, page 192. "The blind or sand buckle scab is very closely related to the solid scab, but occurs at a slightly later period during the filling of the mould, instead of being washed away by the flow of the metal, it is now held in its place. Imagine the temperature of the sand forming the face of the mould suddenly raised to a temperature of 800 to 900 deg. C. for a depth of $\frac{1}{32}$ in. This high temperature causes grains of sand to expand, and when certain conditions prevail, patches of the sand buckle up into the molten metal. A very thin skin which will then have formed on the metal prevents this sand from floating away, but it is not strong enough to resist the pressure causing the buckle which presses inward in the form of angle, the apex of which cracks and allows metal to bleed into the cavity formed."

1938—*Moulding Sand, with Special Reference to Blind Scabs*—S. Carter and A. W. Walker—FOUNDRY TRADE JOURNAL, May 26, page 426. "The chief point to be borne in mind is the blind scab is formed before the metal reaches the defective area, and, moreover standing metal appears to produce the effect to a greater extent than does flowing metal."

1939—(1) *Modern Sand Testing*—W. Y. Buchanan—FOUNDRY TRADE JOURNAL, May 11, page 338. "The formation of scabs depends upon:

$$\frac{\text{Dry compressive strength} \times \text{Permeability}}{\text{moisture, per cent.}}$$

not quite as arithmetically shown."

(2) *Recommended Practice for Sand-cast High-lead Bronzes—Trans.* A.F.A., vol. 47, page 203. "Scabs result from uneven ramming or loose sand in the mould."

* Associate professor, Department of Industrial Engineering, Ohio State University.

Another Look at "Expansion"-type Scabs

1940—*Casting Defects Common to Automotive Grey Iron*—W. B. McFerrin—*Trans.* A.F.A., vol. 48, page 19. See Dietert and Valteir 1935, for one cause. Also, "Some of the causes of rat-tails and scabs are as follow: (*a*) Hard ramming; (*b*) low permeability; (*c*) high moisture; (*d*) high strength; (*e*) low coal content; and (*f*) change in type of clay used."

1941—*Short Term Training in the Foundry*—National Founders Association, page 116, "Scabs: due to high moisture, low permeability, high green-strength, uneven ramming."

1942—*Modern Core Practices and Theories,* H. W. Dietert, American Foundryman's Association, page 495. "This defect seems to form in cornered sections of a core and on cores that have a hard surface."

1944—(1) *Recommended Practice for the Sand Casting of Non-ferrous Alloys,* American Foundryman's Association, page 40. "Scabs result from uneven ramming, loose sand in the mould, weak sand or excessive moisture"; page 72, "scabs result from 'too heavy ramming.'"

(2) *Moulding Sands and Gases in their Relation to Casting Defects,* G. W. Nichols, FOUNDRY TRADE JOURNAL, June 8, page 112. "Rapid expansion invariably damages the mould face resulting in scabbing or buckles."

1946—(1) *Short-term Training in the Foundry,* National Founders' Association. See quotation from 1941 edition earlier.

(2) *Some Patternshop Methods and their Advantage to the Foundry,* H. W. Turner, FOUNDRY TRADE JOURNAL, March 21, page 315. "On horizontal surfaces a change in the angle of flow sometimes encourages scabbing and this can largely be obviated if the patternmaker joins two angles with a large radius with no sudden break to interrupt the smooth flow of metal."

(3) *The Metallurgy of Steel Castings,* C. W. Briggs, McGraw-Hill Book Company, page 448. "A scab is an irregular-shaped mass of metal that usually lies above the casting surface. The defect is due to a combination of spalling and high hot-shrinkage of the sand." "It has also been stated that high moisture-content of sands and moisture in cores are primary causes of scabs."

1947—(1) *Steel Castings,* E. N. Simons, Chemical Publishing Company, page 42. "The scab is usually caused by excessive expansion of the sand at the mould surface." "Scabs are most likely to be seen on large pieces having heavy cross-section, which cool more slowly than thinner-sectioned parts. Page 69, 'Bad gating of casting produces scabs.'"

(2) *Analysis of Casting Defects,* American Foundrymen's Society, First Edition, page 70. "Expansion scabs are rough, thin layers of metal partially separated from the body of the casting by a thin layer of sand, and held in place by a thin vein of metal." "Major cause of defect—uneven ramming."

1948—*Non ferrous Castings,* R. F. Hudson, Chapman and Hall, Limited, page 46. "Lack of permeability promotes blowholes and scabs."

1949—*Foundry Technology,* W. A. Spindler, Ulrich's Book Store, page V-4. ". . . and scabs, are in the first place due to the expansion of the clay-bonded sand mixtures, while the formation of scab requires in addition the occurrence of hot shrinkage."

Foundry Sand Practice, C. A. Sanders, American Colloid Company, page 110. "Causes (*a*) Improper gating at mould cavity entrance; (*b*) hard ramming; (*c*) moulding sand—low permeability, moisture too high, not enough coal-dust, sand expansion due to fines, high flowability, sintering point too low, sand unstable at high temperatures, high hot strength; and (*d*) pouring temperature too high.

1950—(1) *Fundamentals in the Production and Design of Castings,* C. T. Marek, Wiley and Sons, page 73. "A scab is formed when the mould skin fractures and a portion of the skin rises, permitting metal to flow under the skin."

(2) *Condensation Causes Scabbing,* from "Corner," FOUNDRY TRADE JOURNAL, March 2, page 230. "The condensed moisture from steam collecting on the top of cores creates a condition which may lead to scabbing."

(3) *Glossary of Foundry Terms, The Foundry.* ". . . blemish on the casting caused by eruption of gas from the mould face."

(4) *Casting and Forming Processes in Manufacturing,* J. S. Campbell, Jr., McGraw-Hill, page 267. "Expansion scabs are rough thin layers of metal partially separated from the body of the casting by a thin layer of sand and held in place by a thin layer of metal. Remedy—reduce mould hardness and reduce expansion characteristics."

(5) *Influence of Sand on the Formation of Scabs,* D. A. Taylor, *Jour.* Res. and Dev., BCIRA, vol. 3, No. 9, December, 1950, page 693. "Original mould surface has been in contact with metal on the sides of the depression and there is a bright line where metal has penetrated into the mould." "Failure of the mould invariably occurs during the period when its surface is strongly heated, but is not covered by molten metal." "Available evidence indicates strongly that failure occurs as a result of the change from alpha to beta quartz." "Olivine replacement failed to produce scabs."

1951—(1) *Scab Defect on Grey Iron Castings,* American Foundrymen's Society preprint 51-23. "The scab is caused by a piece of the mould face flaking or falling off" according to the following hypothesis:—"The formation of a scab on the surface of a casting is the final result of numerous reactions which take place in a few seconds of time. Granules of silica sand are compressed into a shape having some strength due to the adhesive properties of the materials used to coat the grains. The sudden application of liquid iron sets off a series of reactions. Moisture is converted to steam. Organic materials are decomposed. Clays and ceramic materials change structure and mechanical properties. The sand grains expand and tend to cause a compressive stress in the surface layer of the mould. Each successive layer underlying the mould surface is at a different temperature and has a different set of physical properties. When the stresses set up due to expansion exceed the mechanical strength of the moulding materials, a piece of the mould flakes off."

(2) *Load/Deformation Curves on Dried Sand Specimens and their Relation to Expansion Defects,* R. G. Godding, *Jour.* Res. and Dev. BCIRA, vol. 4, No. 3, December page 202. "It is generally agreed that the scab is formed as a result of the expansion of sand which takes place on heating."

(3) *Foundry Practice,* Salmon and Simons, Isaac Pitman and Sons, Limited, page 114. "Scabs occur when a portion of the face or core lifts and metal flows underneath in a thin layer. Causes—use of sand grains that are too smooth and rounded, uneven ramming, slow running and inadequate gating."

(4) *Atlas of Casting Defects,* Institute of British Foundrymen, page 47. "A rough irregular projection on the surface of a casting sometimes containing imbedded sand. Cause: insufficient bond strength in moulding or core sand or sand too fine or lacking in permeability. Also caused by excessive density of the sand due to heavy ramming or local overheating arising from badly placed ingate. Badly prepared sand. Excessive use of 'swab' or water brush. Imperfect drying of dry sand or loam moulds."

(5) *Malleable Foundry Nomenclature, Bulletin* No. 496, Malleable Founders Society, January 10, page 60. "A defect on the surface of a casting caused by the eruption of gas from the mould face, or by uneven mould surfaces; or occurring whether the skin from a blowhole has partly burned away and is not welded to the casting surface."

1952—(1) *Sand Control with Particular Reference to the Prevention of Scabbing*, W. B. Parkes, American Foundrymen's Society preprint 52-42. "Metal enters through the crack at the apex of the buckle and flows behind the layer of sand and appears as a shallow, flat-topped projection on the casting." "Most frequently found where sand is strongly heated before it is completely covered with metal at rest."

(2) *Flowability Tests for Steel Moulding Sands*, J. A. Rossenfoss and L. N. McKibben, *Steel Foundry Facts*, No. 119, February, page 20. "It is generally true that an excessively flowable mix may cause scabs, buckles, rat-tails and other such defects."

(3) *Metallurgy for Engineers*, Wulff, Taylor and Shaler, Wiley and Sons, page 362. "Buckles and scabs usually occur in cope surfaces of castings." "Usually these defects are caused by cope surfaces becoming preheated too rapidly by radiation from the rising metal. The non-uniform expansion of sand at and immediately behind the cope surface, caused by rapid preheating develops stresses sufficient to shear layers of sand from the cope surface. These sheared layers of sand extend into the mould cavity and are surrounded by rising metal. The development of high gas-pressure in a region of too low permeability can also produce excessive stress in the cope and cause scabbing."

1953—(1) *How to Avoid Troubles in the Aluminium Foundry*, D. L. LaVelle, *The Foundry*, December, page 102. "Scab—this is the name given to deposits of excess metal that have penetrated beneath thin layers of sand which have thus been lifted from the mould surface. Sand lifting can be avoided by refraining from patching moulds, a practice which should be severely frowned upon. Weak sand, high moisture content and hard ramming are other likely causes of this kind of trouble. Occasionally the same causes are involved that bring about sand lines and buckles."

1954—(1) *Foseco Foundry Practice*, Technical Service Bulletin No. 2, September, page 7. "Rough 'warty' excretion on surface of castings. Causes:—(*a*) Uneven ramming; (*b*) incorrect gating; (*c*) improperly dried moulds, and (*d*) high clay content in moulding sands."

(2) *Influence of Mould Factors on Casting Defects*, J. H. Gittus, *Jour.* Res. and Dev., BCIRA, April, vol. 5, No. 5, page 273. "Inward movement of expanding sand has also been cited as an explanation for expansion scabs, when its effect is so marked that a portion of the mould becomes detached, allowing metal to penetrate behind it."

(3) *Behaviour of Sand Under Load at Room and Elevated Temperatures*, R. G. Godding and R. Rew, *Jour.* Res and Dev., BCIRA, April, vol. 5, No. 5, page 278. "Defects such as expansion scabs and rat-tails depend on whether all the expansion can be accommodated without complete collapse or distortion of the mould face." "At present there is no test that will reveal whether scabbing is due to the sand itself or to the preparation and moulding technique."

Present Author's Views

A study of the literature reveals three points of interest. First, that from 1912 to the present there is evidence that unanimity is markedly lacking as to the cause of scab formation. Second, if any causes predominate it might be claimed that expansion of the sand and improper gating appear most frequently. Third, that scabs are produced before or at the time the mould is completely filled. There is a quotation "Fools rush in where angels fear to tread" and this article proposes an approach to the scabbing problem which is quite different from the customary approach. According to Vadeboncoeur[1] "It is the writer's belief that at least 5 per cent. of any battle is the knowledge of the true character of his opponent." The 5 per cent. figure is a very modest value and a knowledge of the true character of scabs is all-important in devising strategy to deal with this defect.

One procedure toward understanding scabs is to use the scientific method which is comprised of three parts, namely, observation, hypothesis and verification. The more data and observations one collects in a systematic manner the better. After sufficient observations have been collected a search should be made for a possible explanation to account for the observations. Such an explanation is called a hypothesis, or, better still, it is a shrewd guess; but such a "hunch" is not enough, it must be verified. To do so, a suitable experiment is devised to test the "hunch" and decide in advance what the outcome of the experiment should be. Perhaps the results of this experiment do not agree with the predetermined expected result. One then seeks a new hypothesis or "hunch" that can be verified. When verification of the notion has been accomplished it is then proposed that others repeat the experiments and devise experiments of their own to support it. If all the experiments support the hypothesis, it may be found that the notion is promoted to a theory, which really means that all available evidence up to then points one way. The material presented herein will be concerned with observations and a hypothesis. At same future date, possibly, a suitable theory will be forthcoming.

Observations

Since the first step in the method enunciated calls for observations, the following are submitted for consideration for "expansion"-type scabs.

1. From several moulds where it is known that the mould cavity has been filled with metal and, subsequently, a run-out has occurred leaving a shell, an expansion scab has never been observed on the casting. This observation leads one to question the commonly-accepted thinking that these scabs form as soon as the mould is filled. Further, many bleeding tests have been conducted and reported in the literature and no mention has been found concerning scabs, penetration or veining being present on such test castings.

2. Regardless of the size of the "expansion" scab or the size of the sand grains, the thickness of the layer of sand separating the scab from the casting does not vary a great deal. This observation leads one to question if what happens to the moulded sand beyond the thin layer is of any consequence.

3. The "expansion"-type scab always occurs at a "hot spot" or hot area of a casting.

Another Look at "Expansion"-type Scabs

If this is a true observation, and all of the mould surface has been elevated to a temperature level above that required for the inversion from alpha to beta quartz, then some factor in addition to the expansion of quartz is predominantly in control of scab formation.

4. Accompanying the "expansion" scab is a V-shaped depression in the casting, the apex of which follows along a T-section or points out the direction of metal flow in the mould cavity.

5. The connection between the casting and the "expansion"-type scab consists of one of two kinds. First, the connection—particularly for small scabs—is almost a point; second, the connection is along a line at the apex. Due to the first type of connection, one is privileged to question that metal flows in behind sand on filling the mould cavity.

6. In most instances, "expansion" scabs can be eliminated by a change in the gating system. Such a change does not obviate the fact that the expansion of quartz has taken place upon subjection to heat. If expansion, then, was the cause, a gating change should have no effect on eliminating this defect.

If the scab is formed by the time the mould cavity becomes filled, it seems reasonable to expect that the chemical composition of the scab should bear close resemblance to that of the melt or to the casting. Taking a lead from Vadebonceour, it was decided to find out if one of the characteristics of scab was a reasonably close agreement in chemical analysis or if the scab composition was different from the body of metal.

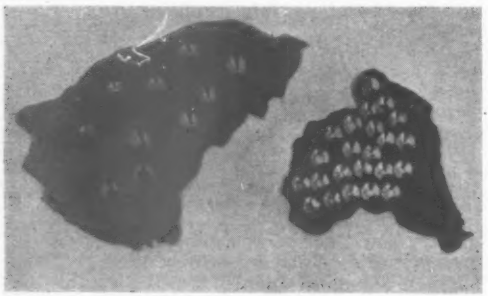

FIG. 1.—*Two scabs (both about the size of a hand) removed from a steel casting* 14-*ft. long by* 30-*in. wide and* 1-*in. thick.*

Fig. 1 shows two scabs about the size of one's hand removed from a steel casting the approximate dimensions of which were 14-ft. in length and 30-in. in width with a thickness of 1-in. The scabs were well cleaned before drillings were removed for analysis, and the compositions along with that of the casting are given in Table I (A) along with the analyses of two additional scabs B and C and their respective castings, both in steel.

TABLE I.—*Percentage Composition of Scabs and Casting Body.*

Examples A.	Casting body.	Scab No. 1.	Scab No. 2.
C	0.29	0.23	0.21
Si	0.35	0.34	0.35
Mn	0.65	0.65	0.65
S	0.032	0.039	0.040
P	0.032	0.033	0.033

Examples.	B.		C.	
	Casting.	Scab.	Casting.	Scab.
C	0.33	0.37	0.40	0.40
Si	0.42	0.55	0.52	1.06
Mn	0.91	0.88	0.74	0.77
S	0.026	0.036	0.031	0.039
P	0.012	0.003?	0.024	0.018

Examples of scabs on aluminium castings were not too prevalent and when found were not large enough for usual analytical procedures. Therefore, the scab and a section from the casting were submitted for semi-quantitative analysis.* The results in Table I indicate wherein the composition of the casting and the scab differed, along with relative differences. Where differences were found the amount of element present did not exceed the classification, low (0.1 to 1.0 per cent.).

TABLE II.—*Spectrographic Analysis of Aluminium Castings and Scabs taken from them.*

Casting No.†	Casting.	Scab.
1	1.5 × Zn	1.5 × Ti 2—10 × Ca
2	1.5 × Zn 2.0 × Zn	2—10 × Ca
3		2 × Ca
5	2 × Zn	1.5 × Ti 10 × Ca
7		1.5 × Ti 2—10 × Ca
8	1.5 × Zn	1.5 × Ti 2—10 × Ca
9		1.5 × Ti 2—10 × Ca

† Taken from runner-bars considered to be identical with the casting (made at the Columous Malleable Iron Co., Columbus, Ohio).

A souvenir ash-tray in the shape of Ohio Stadium, Columbus, was found to have a scab present between the towers. The small scab and a section cut from the casting were submitted for a semi-quantitative analysis and the following results were obtained:—

Casting.	Scab.
1.5 × Mn	1.5—2.0 × Zn 2.0—4.0 × Ni 1.5 × V 1.5 × Cr 1.5 × Sn

From the analytical data presented it seems appropriate to decide temporarily that the composition of scabs can be different from that of the casting.

In observing various castings it was noted many times that in cavities rounded globules were present. It was reasoned that such globules would have compositions different from that of the casting. In

* Carried out by National Spectrographic Laboratories, Cleveland.

producing cast-iron spheres for athletic purposes, sometimes cavities were found with globules of considerable size attached to the casting at one point; analysis of the globule and casting revealed the results recorded in Table III.

TABLE III.—*Percentage Composition of Cast-iron Spheres and Globules attached inside Cavities.*

	Casting.	Globule.
Total carbon	3.98	3.26
Graphitic carbon	3.29	2.42
Combined carbon	0.69	0.84
Si	0.96	1.07
Mn	0.12	0.108
S	0.051	0.077
P	0.053	0.074

The difference in composition between the casting and globules found in the cavities is well substantiated, as will be noted from the following examples from the literature. Vadebonceour[1] considers such ferrous-base globules to be high in phosphorus. Of considerable importance is the following statement by Vadebonceour. "A close study of globules containing phosphorus will show that they are attached to the casting at one point. They will be found in interior cavities, where they were extruded during the solidification of the casting." Fischer[2] speaks of such globules as buttons, and provides the analytical data reproduced in Table IV.

TABLE IV.—*Percentage Composition of Parent Metal and Globules (after Vadebonceour).*

Element.	Casting.	Button.
Cu	86.84	71.08
Su	4.31	12.89
Pb	3.86	13.53
Zn	4.35	1.48
P	0.01	0.01
Ni	0.45	0.72
Fe	0.17	0.23
Sb	0.07	0.08

Morey and Kattus[3] provide comparative analytical data for casting, globule and vein as in Table V.

TABLE V.—*Comparative Analytical Data for Casting, Globule and Vein (after Morey and Kattus).*

Per cent.	Casting.	Globule.	Vein.
Cu	89.8	79.0	84.2
S	10.3	17.3	14.3
P	0.6	2.0	1.5

TABLE VI.—*Variation in Composition from Casting to Globule (after Smithson).*

Per cent.	Casting	Globule.
T.C.	3.19	3.95
Si	1.18	1.20
Mn	0.49	0.44
S	0.107	0.045
P	0.048	0.079

Smithson[4] reports that extrusions into blowholes were brought about by the pressure of graphitization on the residual liquid metal during solidification and that the exudations (globules) varied in composition from the casting, as shown in Table VI.

Another observation to be recorded concerns the well-known types of segregation that take place when alloys solidify. Considerable literature is available describing solidification processes "direct" and "inverse." It is to be noted also that the last portion of any casting to solidify does so at the hot spot or hot area of the casting. Brandt, Bishop and Pellini[5] depict in their Fig. 4 the solidification times required for "L" and "T" sections. Ellis[6] illustrates in the effects of "sweating" in his Figs. 2 and 3.

Hypothesis

With the above observations and data available it is possible to set out to derive a hypothesis or "hunch" which will explain why the "expansion"-type scabs occur. It will be first assumed that personal observations indicate, amongst other things, that scab composition is different from that of the casting. Also, if the solidification of the alloy in a casting section occurs in such a manner that the last alloy to solidify does so adjacent to the mould/metal interface, such a location can be considered as a hot spot or area. Due to the type of solidification known, it follows that just before final solidification the composition of the remaining liquid adjacent to the hot spot is different from the rest of the casting. One illustration of this is shown (in his Fig. 4) by Sobers.[7]

About 1951, Mr. E. D. Hoenicke, Eaton Manufacturing Company, gave an illustrated talk to the Central Ohio AFS Chapter. One of his slides showed an extrusion from the top of the downgate which occurred some time after the pouring was completed. Could this have been a manifestation of solidification pressures acting on the remaining liquid just prior to complete solidification? Smithson[4] and Vadebonceour[1] indicate such can be the case. The concept of pressure is related, for in the literature it is found that globules result because of extrusion and exudation of liquid through a surface.

So far, this hypothesis claims that located adjacent to a hot spot at the mould/metal interface there is within the casting a quantity of liquid alloy under solidifying pressures the composition of which varies from that of the solid alloy. It still remains to complete the hypothesis on scab formation in describing why a particular shape is common to all "expansion"-type scabs.

Returning to the confined remaining liquid alloy which is under pressure adjacent to the mould/metal interface, it is possible that a very thin skin is present over the liquid. When the solidifying pressures are sufficient to exceed the skin strength it is punctured at a point or along a line and liquid alloy is forced into the moulded sand mixture to a depth of a very few layers of sand grains. Simultaneously, atmospheric pressure is being applied to the casting surface through the pore spaces in the moulded mixture, solidification is tending to form a vacuum and the atmospheric pressure forces the thin skin inwards, with the resulting familiar V-

shape. This skin carries attached to it the few layers of sand grains. The degree to which a localized area is more strongly heated than the surrounding mould area, the larger will be the remaining pool of liquid alloy with respect to depth and breadth. The deeper atmospheric pressure forces the thin skin, the greater the depth of the cavity opened in the mould to receive the exuded material.

This concludes the hypothesis given to explain the formation of the "expansion"-type scab. Much experimentation will be necessary in order to elevate the outlined hypothesis to the status of a theory. If the hypothesis is of any value it should indicate that one important factor in eliminating "expansion"-type scabs is to ensure that final solidification in a casting section does not occur at a mould/metal interface. This may have been what Satz[8] had in mind when he stated, "In another sense, the greater the ease of dissipating heat, the less will sand tend to form scabs."

Many literature references cited indicate that improved gating eliminated the scabs. The hypothesis supports that conclusion only when the gating system is such that hot spots are sufficiently reduced so that final solidification occurs at a safe distance from the mould/metal interface.

Changing the sand mixture and altering the degree of mould compaction are known to have eliminated "expansion" scabs. The hypothesis presented can account for this, because the rate of heat dissipation from various sections has been altered sufficiently to bring about a change in location of final solidification. Possibly, the hypothesis can be enlarged to explain the mechanism of penetration and vein formation. Further studies along this approach are contemplated.

According to the hypothesis presented, foundrymen can be mentally relieved of worry as to one source of sand grains in the casting. If, as postulated, the scab is not formed until most of the casting is solid, any included sand grains must come from another source. It is suggested that the name of this type of scab be changed to exudation scab in order to differentiate from the erosion-type of scab.

Conclusion

An hypothesis is presented to account for the formation of the "expansion"-type scab. It is claimed that "expansion"-type scabs result from the exudation of liquid alloy from a casting section just prior to final solidification. Elimination of this defect will result from ensuring that final solidification in the casting section occurs well within the confines of the casting.

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GEC to Raise More Capital

Plans to raise £10,500,000 by internal issues of loan stock and ordinary shares are announced by the General Electric Company, Limited. Preference and ordinary stockholders and holders of the existing loan stock registered on January 20 may subscribe for £6,000,000 of 4 per cent. unsecured loan stock 1975-1980 at a price of 97½. The application money is £10 per cent. payable by February 24 and the final payment of £47 10s. is not due until July 15.

For ordinary stockholders only, there is also a rights issue of 1,959,240 £1 ordinary at 48s. per share on the basis of one share for £6 of stock held on January 20. They will have until March 4 to accept the provisional allotments and to apply for excess shares.

The directors have decided to raise more capital because the group's business continues to expand, and more funds are required to provide extensions, to meet the increased costs of modernization and re-equipment of plant and buildings, and for working capital. Profits at least up to last year's standard are expected for the year to March 31, 1955. An interim dividend of 4½ per cent. on the existing ordinary stock will be paid on April 7 and the directors expect the final will be 8 per cent. on the increased capital.

HARRISON, MCGREGOR & GUEST, LIMITED—Following the acceptance by 95 per cent. of the ordinary and 99 per cent. of the preference shareholders of the offer for the company's share capital by the David Brown Corporation, Limited, Mr. David Brown and Mr. James Whitehead have been appointed directors.

Reducing Smoke in Scotland

Smoke reduction in Scotland was the theme of a conference held in Glasgow recently under the auspices of the National Industrial Fuel Efficiency Service and the Combustion Engineering Association. About 350 representatives of business interests and local authorities attended the conference, which was described as the most successful to be held in Scotland during the 12 years of the national campaign for fuel efficiency.

Sir Patrick Dollan, chairman of the Scottish Fuel Efficiency Committee, said that the committee aimed at a saving by industry of 1,000,000 tons of coal a year. If that could be achieved they would be self-supporting and would not longer require to import coal from the United States and Europe. He estimated that in 10 years, at a cost of about £5,000,000 a year, smoke in Scotland could be modified to such an extent that it would no longer be a nuisance to industry, to the community, or to the individual. This would save industry about £250,000,000.

Sir Patrick pledged the help and advice of his committee in any smoke abatement schemes proposed by Scottish industrialists.

A QUARTERLY DIVIDEND of 55 cents is announced by the International Nickel Company of Canada, Limited. For the year 1954 the quarterly rate was 50 cents and with an extra dividend of 90 cents for the final quarter, the total payment was $2.90 per common share, compared with $2.35 for 1953. The quarterly dividend had been 50 cents since the third quarter of 1951.

Publications Received

A Pioneer in Education—being a short account of the past and present activities of the Birmingham and Midland Institute.

This Institute became a corporate body through an Act of Parliament in 1854 and the foundation-stone of the premises was laid by the Prince Consort in 1855. The building of which the Institute forms a part was designed by Sir Charles Barry, who also designed the Reform Club and Bridgewater House and is regarded as being amongst the foremost of Victorian architects. The Institute was formed for the diffusion of science, literature and art, and, as would be expected, organizations started within the Institute grew so rapidly that fresh premises had to be acquired. Thus many of the great specialized schools now existing in Birmingham had their origin in the Institute. Now, stronger than ever, it caters for cultural activities of a great community. The centenary programme of Monday-evening lectures is so fascinating that it would be difficult to decide—if one lived in the area—which item could without sacrifice be omitted. They are as excellent as they are varied in their appeal.

Safety Code for Industrial Power Trucks. Published by the Industrial Truck Manufacturers' Association, 94-98, Petty France, London, S.W.1; price 2s. 6d. post free.

Whilst in general the use of industrial trucks reduces the incidence of accidents, they obviously have their potential dangers. This book has entered into the safety question very thoroughly and the observance of the precepts enunciated will go very far to minimize the risks to be associated with their use. All such small matters as leaving the engine running in a confined space are dealt with, whilst special hints are given for handling fork-lift trucks. The booklet is divided into six parts and is suitably illustrated. All foundries using industrial trucks should certainly acquire a copy of this 52-page booklet, for at the very minimum it will inform the drivers just what is expected from them.

House Organs

Ruston Overseas News, No. 17, Vol. 2. Published by the Ruston-Paxman Group, Lincoln.

The first article, "New Power Formula for Italy" deals with the harnessing of natural gas—now an important factor in Italy's economy—by Ruston plant and it makes very interesting reading. The romantic side of industry is insufficiently publicized; and more articles of this type going abroad would be an antidote to news of unofficial strikes and the like.

From Italy, the scene moves to Canada, Denmark, India, Malaya, Baghdad and Australia, the whole making excellent reading.

Steel Horizons, vol. 16, No. 4. Published by the Alleghenny Ludlum Steel Corporation, Pittsburgh, Pa.

This beautifully illustrated magazine devotes its space to printing stories about the users of the publisher's brands of stainless steel. In this issue, dairy farms, hotel kitchens, tractors, and vitamins all come to life in its vivid pages. As usual, it makes excellent reading—if appreciation of pictures be included.

A 200-YEAR-OLD iron lintel joint, 7 ft. long, made by the well-known ironfounder, Samuel Walker, has been presented to Rotherham Museum.

New Catalogues

Electric Lamps. The British Thomson-Houston Company Limited, Crown House, Aldwych, London, W.C.2, has issued a fresh catalogue covering Mazda lamps. In 26 sections it deals with an infinite variety of lighting, heating, electric-discharge, projector, photographic, and many special-duty lamps. The catalogue is profusely illustrated and an inset shows how much purchase tax has to be added for the various groups. The only thing it does not reveal is the origin of the trade mark "Mazda." It is the type of catalogue that is filed away because of its real usefulness and is available to readers on writing to Crown House.

Basic Bricks, a 44-page nicely illustrated brochure, has been received from John G. Stein & Company, Limited, Bonnybridge, Scotland. Locations where the firm's basic refractories are employed are shown by means of coloured diagrams of various types of furnaces, in this catalogue. The type of brick recommended for each application is given and there is included much technical data about these materials. The one recommended for basic cupola work is Mag C. brand. This brochure is available to those who write to the Bonnybridge address.

Basic Refractory Concretes. In a four-page leaflet, General Refractories Limited, Genefax House, Sheffield, 10, detail the nature of four types of basic refractory concretes known as Pyrocrete. They vary widely as to composition and use, but the methods of measuring, applying and drying are similar and each one is set out in considerable detail. In general, the four types include either or both magnesite and chrome. It is interesting to note that one, based on magnesite, is designed for lead-melting furnaces.

Pyrometers. Cambridge Instrument Company Limited, 13, Grosvenor Place, London, S.W.1, have issued a leaflet which describes and illustrates recent developments of the well-known Féry pyrometer. The first type is of the conventional pattern, but distinctly more robust, whilst the second is of the water-cooled type and is designated "Quick Response". The leaflet is available to readers who write to Grosvenor Place.

Atomic Models. Rivalling a horticultural catalogue in its lavish colour pictures is one received from Griffin and Tatlock Limited, Kemble Street, Kingsway, London, W.C.2, which brilliantly illustrates and clearly describes a range of the Courtauld atomic models. They are used for demonstrating the building of molecules. Our more-scientific readers should certainly write to Kemble Street for the favour of a copy.

IN the JOURNAL of January 13, it was stated in the paragraph headed "Industrial Radiography" that an exhibition would be held on April 27 at the Grand Hotel, Manchester. This was an error as the actual venue is the Midland Hotel, Manchester.

MANCHESTER UNIVERSITY is to start the first full-time university course in Europe for the training of atomic engineers. It will last six weeks and will be conducted by Prof. J. Diamond, of the Department of Engineering at the university, who was formerly at the Atomic Energy Research Establishment at Harwell. Most of the students will be drawn from industry. It is hoped that the lectures will be extended next year to undergraduates, who will have the option of taking nuclear engineering as a subject in their final degree examinations.

G

New British Standard

Sizes of manufacturers' trade and technical literature (including recommendations for contents of catalogues) (BS 1311 : 1955).—This standard has been prepared following requests from a number of important trade associations, chiefly in the engineering and building industries, and no fewer than 38 organizations took an active part in the work; it is designed to overcome two main difficulties. First, when large plant is installed, one aspect of the contractor's work is simplified if he can furnish full working instructions to his customer by assembling into one binder all the instruction sheets issued by sub-contractors and suppliers of ancillary equipment. This is often not practicable unless all the literature is of the same size and in any case a heterogeneous collection of sizes presents an untidy appearance that hardly constitutes a good advertisement.

Secondly, with catalogues, brochures and pamphlets similar considerations arise. The psychological aspect of this is particularly important for exports, because sizes of literature have been standardized in many countries for years. In addition, even if there is no question of grouping with other publications, a great variety of shapes and sizes can become a considerable nuisance to librarians and others who wish to retain literature for reference. Some publishers deliberately produce brochures, etc., in non-standard sizes so that they should stand out from those of their competitors, but they may be thrown away because they are inconvenient!

The standard applies to all types of literature issued by manufacturers except "throw-away" publicity leaflets, although there is no reason against applying it also for these. Two sizes are provided and the choice will in practice be governed by requirements; both have the advantage that they can be cut from stock sizes of almost all the types of paper likely to be used.

Certain large undertakings had decided upon their own standards some years before this standard was suggested, and much credit is due to them for this initiative. Unfortunately, the sizes adopted by them are often different from those of the British Standards, and where their size differs it may possibly be some little time before a change is possible. Nevertheless, it is hoped that all organizations will recognize the desirability of adopting one of the standard sizes as soon as possible. Copies of this revised British Standard are obtainable from the British Standards Institution sales branch, 2, Park Street, London, W.1; price 2s. 6d.

Record Employment in 1954

Although there was a seasonal fall of 100,000 in December, at the end of 1954 the number of workers employed in the United Kingdom, at 22,700.000, was higher than in any previous year, being 350,000 greater than in December, 1953. During 1954 the manufacturing industries gained 260,000 new workers, 180.000 of these entering the engineering, metals, and vehicle manufacturing group.

The number of workers out of work at the middle of January this year represented 1.4 per cent. of the total working population, against 1.8 per cent. a year ago. Of the 298,000 unemployed at mid-January, about 100 000 had been out of work for more than eight weeks.

There is still an acute labour shortage in most parts of the UK. The latest figures show that in October last year for every unemployed worker there were about one and a half jobs. The percentage of unemployed throughout 1954 averaged less than 1½ per cent.

Determination of Hydrogen in Liquid Steel

An account of an investigation comprising, on the one hand, a study of the influence of the sampling time on the determination of hydrogen in steel, and, on the other, comparative tests with two different methods, by Sven Bergenfelt and Lars Bjerkerud, together with results, is published in "Jernkontorets Annaler" vol 138, 1954. The results show the great importance of the sampling time when analyzing hydrogen in steel. However, the time during which the test-piece is kept in carbon-dioxide snow (24 hrs.) was found to have no noticeable influence on the analytical values. The comparative tests comprised a casting method with a subsequent protection of the test-piece in carbon-dioxide snow, and an absorption method where the test-piece was kept in a vessel with mercury. The tests show that the casting method is more suitable than the absorption method. The authors emphasize that in order to get acceptable and comparable values when analyzing hydrogen in steel, it is most important that the time of sampling is as short as possible and that this time and the method of sampling are always the same.

To Guard Glasgow's Commerce

At the monthly meeting of the directors of Glasgow Chamber of Commerce, Mr. R. W. Lamont was unanimously elected president of the chamber for the ensuing year. Mr. Lamont, who was the vice-president and honorary treasurer of the Chamber, is the managing director and deputy chairman of Watson, Laidlaw & Company, Limited, machinery manufacturers and founders. He is a member of the Scottish Board for Industry, and until recently was a member of the executive committee of the Federation of British Industries and also of the executive committee of the Scottish Council of the Federation.

Succeeding Mr. Lamont as vice-president and honorary treasurer of the chamber is Mr. J. Martin Baxter, a director of P. & W. Maclellan, Limited, iron and steel stockholders. The directors also re-elected Sir Andrew Macharg, a director of the North British Locomotive Company, Limited, and the Mirrlees Watson Company, Limited, as an honorary vice-president for one year.

The retiring president of the Chamber, Mr. T. G. Robinson, gave a warning at the meeting of the inflationary tendency that had developed in the last few months. The past year had been a good one for most business, he said, but rising costs were a menace to those trying to produce goods in international competition and necessitated a policy of restraint and the building-up of reserves.

Gas Coke Price Increases

Increases in the maximum retail price of gas coke from January 31, authorized by the Ministry of Fuel and Power to meet higher costs of production and retail distribution, were announced recently.

The increase throughout all the areas covered by the North Thames Gas Board will be 1s. 8d. a ton. In the South-Eastern Gas Board area, the increase in London will also be 1s. 8d. a ton, and in Kent, Surrey, and Sussex 2s. 11d. a ton.

In the Eastern Gas Board area, the increase will be 5s. a ton in east Norfolk and east Suffolk, and in the rest of the board's area, except London, the increase will be 2s. 8d. a ton. In its London area it will be 1s. 8d. a ton.

Aluminium Casting Alloys*

By R. Mercer, B.Sc. (Eng), A.M.I.Mech.E.

[*Abridged*]

Aluminium casting alloys are an extensive subject and cover a wide field. It is therefore desirable to define the scope of this Paper more precisely, which is to make the British Standard for aluminium alloy castings for engineering purposes, namely BSS 1490/49, the basis and to discuss the various alloys listed in it. Attention will also be drawn to a group of alloys with interesting properties, which are not being used in this country as far as is generally known.†

Before getting down to details, the usual order is being reversed and the opportunity taken to thank all colleagues who have helped in the preparation of this Paper, and whose constructive criticism will share largely in any merits which it may possess. The Author is further greatly indebted to the directors of Enfield Rolling Mills (Aluminium), Limited, for their kind permission to publish it.

At this stage it must also be explained that the general usage in referring to both pure aluminium and aluminium-base alloys as "aluminium" is being followed. Strictly speaking, this is not correct, of course, but probably this usage has developed, since the proportion of pure aluminium applied on its own is small, at least for castings.

B.S. SPECIFICATION 1490/49

Origin

Like other British Standards, number 1490/49 was drawn up by the industry concerned. It therefore represents the concensus of opinion of the interested parties of the industry, obtained by compromise between differing views where necessary. This approach to standardization is noticeable in the selection of the specifications for inclusion in the standard. Also in accordance with its policy, the British Standards Institution merely lists the specifications without indicating their relative importance or instructing the user in their respective purposes. It may therefore be of interest to examine the specifications in the standard from this angle.

Piston Alloys

When considering the various specifications in order to group them according to their purpose, one finds so much overlapping that really only one group stands out clearly. This is the group of "piston alloys," comprising LM.12, LM.13, LM.14 and LM.15. The term "piston alloys" covers their most characteristic, though by no means their only, use. They are all heat-treatable alloys which maintain good strength and hardness at elevated temperatures. Of them, LM.13 is probably the most popular alloy, followed by LM.14 which possesses a greater strength at the highest temperatures than the other three. Its "castability" is inferior to that of LM.13, however. LM.12 and LM.15 are more rarely used.

Divisions of the Specification

Since a satisfactory grouping of the remaining 17 specifications in BSS 1490/49 according to the purpose of the castings is not practicable, an attempt is made to split them into three divisions in accordance with their relative importance. In doing so, it is realized that this is a highly contentious enterprise and that the division may be attacked and criticized strongly by many who see the importance of this or that alloy in a different light. Nevertheless, the writer will be well satisfied, if a discussion of this subject will ultimately lead to the elimination of unnecessary specifications from the British Standard and thus to its simplification. Such a simplification would be welcomed by all sections of the aluminium-alloy casting industry, refiners, founders and users alike, and would be of real benefit in increasing the application of aluminium-alloy castings.

The proposed three divisions are:—(*a*) Specifications commonly used; (*b*) those occasionally used; and (*c*) specifications rarely used.

(*a*) *Commonly Used Specifications.*—In selecting the specifications which are commonly used, those alloys have been noted for which the Federation of Light Metal Smelters regularly publishes prices in the technical Press. It is estimated that these four alloys represent in tonnage about four-fifths of the total consumption of aluminium casting alloys in this country. They are LM.1, LM.2, LM. 4 and LM. 6 (and the corresponding aircraft, DTD and other specifications of the same type of alloys). Of the four alloys, LM.4 is easily the most important, followed by LM.6. Both are so well known that they require no description here; they both can be used for sand, gravity-die and pressure-die-castings. In importance they account for probably more than half the total consumption of aluminium casting alloys in the UK. LM.1 is popular for castings where high mechanical properties are not required and is used to best advantage for gravity-die-castings. It is quite fluid, although in this respect perhaps slightly inferior to

* Paper originally given to the West Riding of Yorkshire branch of the Institute of British Foundrymen and last month, also, to the Lancashire branch, with slight modifications (which have been incorporated).

† Since the Paper was first read, an announcement has been made in the technical Press that an alloy of this group can now be made available in the U.K.

LM.4, but it is greatly superior to the latter in its very good machining properties; LM.2 finds its main use in pressure-die-castings.

(*b*) *Specifications Occasionally Used.*—The specifications which are occasionally used are numerically easily the largest division. They comprise LM.3, L.M.5, LM.7, LM.8, LM.9, LM.10, LM. 11 and LM.18. Of these LM.8, LM.9 and LM.18 can perhaps be considered together, since they are all basically aluminium/silicon alloys. LM.18 with its lower silicon content has better machining properties than LM.6 and is sometimes used in its stead where the lower strength does not matter, as in the food industry. The alloy can be sand, gravity-die and pressure-die cast. LM.8 is similar to LM.18, except for the addition of ½ per cent. Mg and ½ per cent. Mn, for heat-treatment. In castability it is slightly inferior to LM.18, but it is useful where its relatively high strength combined with its good corrosion-resistance in marine atmospheres is an advantage. This alloy has come more to the foreground recently and is perhaps the most popular of the medium-strength, heat-treatable alloys. LM.9 compares with LM.6, as LM.8 compares with LM.18; it possesses much greater strength when it is fully heat-treated, but its ductility is much lower. Its castability is similarly slightly inferior to that of LM.6 in die-castings, although its fluidity is better than that of modified LM.6.

LM.5 and LM.10 can be regarded as forming another class, since they are of the aluminium/magnesium type of alloy and both require to be made from high-purity material. They are both used for sand and gravity-die castings. Both alloys are useful for applications where colour anodizing is important, since they take to this treatment particularly well. Castings to be anodized must, of course, be free from surface imperfections, such as inclusions and porosity. LM.5 is not an easy alloy to cast and it is advisable to use an inhibitor in the sand to guard against metal/mould reaction, although its magnesium content is still low enough to allow it to be melted and cast under normal conditions; it is not heat-treated. Its advantages are the excellent corrosion resistance in marine atmospheres, its good machinability and its ability to take a satisfactory po'ish. LM.10. when heat-treated, gives the highest ultimate tensile stress and elongation of all the alloys in the Standard. It is a difficult casting alloy and requires an inhibitor in the sand to prevent mould reaction. Unless special precautions be taken, it must be melted and cast under a protective flux or atmosphere. It is very difficult to obtain the specification minima laid down for the mechanical properties at the lower limit of the specification-range for magnesium in sand castings.

LM.11 is an aluminium/copper alloy, made from high-purity materials only. Its castability is not good and owing to its proneness to hot-tearing it requires a special foundry technique. In mechanical properties it resembles LM.10, except in its lower ductility. It machines equally as well as LM.10, but its corrosion resistance is much lower. In comparing it with LM.10 it could be argued that it offers no advantage over this alloy except for the special precautions necessary with the high-magnesium content, and that its use might be discontinued in favour of LM.10.

LM.7 is used both in the as-cast and the heat-treated condition. It is a rather complicated alloy, having copper, magnesium, silicon, iron, nickel and a grain-refiner as alloying elements. Its castability is quite good and it machines well.

LM.3 is an aluminium/zinc/copper alloy, and possesses the greatest strength and hardness of all the non-heat-treatable alloys in the Standard. Its machining qualities are excellent. It is fairly soft and ductile after casting and attains its final strength almost completely after 21 days. In a comparison of aluminium alloys with other foundry metals for mechanical properties, it would appear as almost identical to cast iron.

(*c*) *Rarely-used Specifications.*—The specifications which are rarely used include the remainder of the Standard, namely LM.0, LM.16, LM.17, LM.19 and LM.20. Because of their infrequent application it is not proposed to discuss them any further here.

ALUMINIUM/ZINC/MAGNESIUM ALLOYS

One class of aluminium casting alloys, which has come very much to the foreground since the war, has not been included in the British Standard, probably because their use is not commonly practised in this country. They are the aluminium/zinc/magnesium alloys which have become established casting alloys in the United States. Many of them are covered by Patents.

The theoretical basis of these alloys dates back to the early 'twenties, when Gürtler and Sander drew attention to the intermetallic compound $MgZn_2$ as capable of giving great strength to aluminium alloys without rapidly decreasing the ductility. A later development of this type of alloy

TABLE I.—*Percentage Composition of the ZC and ZG Series of Aluminium/Zinc/Magnesium Casting Alloys.*

Alloy.	Sand or gravity-die.	Composition, per cent. (single figures are maxima).										
		Cu.	Mg.	Si.	Fe.	Mn.	Ni.	Zn.	Pb.	Sn.	Ti.	Cr.
(*a*) ZC 60 A ..	G.-d.	0.35-0 65	0.25-0.45	0.3	1.4	0 05	0 05	6 0-7.0	0 05	0 05	0.2	0.05
ZG 61 B ..	S.	0 35-0 65	0 6-0 8	0.15	0.5	0.05	0 05	6.0-7.0	0.05	0.05	0.2	0 05
ZC 81 A ..	S.	0.4-1.0	0.2-0 5	0.3	1.0	0.6	0.1	7.0-8 0	0 1	0 1	0.2	0 3
ZC 81 B ..	G.-d.	0.4-1.0	0.2-0.5	0.3	1.3	0.6	0.1	7.0-8.0	0.1	0.1	0.2	0.3
(*b*) ZG 61 A ..	S.	0.3	0.5-0.65	0.25	1.0	0.3	0.05	5.2-6.0	0.05	0.05	0.1-0.25	0.4-0.6
(*c*) ZG 32 A ..	S. & G.-d.	0.2	1.4-1.8	0.2	0.8	0.4-0.6	0 05	2.7-3 3	0.05	0 05	0.2	0.2-0.4
ZG 42 A ..	S. & G.-d.	0.2	1.8-2.4	0.2	0.8	0.4-0.6	0.05	4.0-4.5	0.05	0.05	0.2	0.2-0.4

TABLE II.—*Properties of the ZC = ZG series of Alloys Shown in Table I.*

Alloy	Sand or gravity-die.	Ultimate tensile strength, tons per sq. in.	0.2 per cent. proof stress, tons per sq. in.	Elongation, per cent.
(a) ZC 60 A	G.-d.	12½		7
ZG 61 B	S.	14	9	2
ZC 81 A	S.	13½	10	3
ZC 81 B	G.-d.	14	10	4
(b) ZG 61 A	S.	14	10	3
(c) ZG 32 A	S.	13½	7½	5
ZG 32 A	G.-d.	16½	7½	10
ZG 42 A	S.	14½	10	2
ZG 42 A	G.-d.	18½	11	4

was made by Comstock, who suggested the addition of chromium to improve the corrosion resistance and titanium as grain refiner. Bonsack found a more powerful hardening agent during the 'thirties in the intermetallic compound $Mg_3Zn_3Al_2$.

The development of the aluminium/zinc/magnesium casting alloys falls thus into three classes:

(*a*) the alloys depending on $MgZn_2$ as hardening agent;

(*b*) the alloys depending on $MgZn_2$ as hardening agent, with the addition of Cr and Ti.

(*c*) the alloys depending on $Mg_3Zn_3Al_2$ as hardening agent, which, by the way, also contain Cr.

Table I shows the appropriate specifications in their classes, together with their compositions. Table II gives the minimum ultimate tensile stress to the nearest ½ ton and elongation as given in the official specifications; they are shown in the cast condition after natural ageing. Typical values tend to be higher.

An interesting light on the relative importance of the various aluminium/zinc/magnesium alloys is provided by the American Metals Handbook. In the 1948 edition only one is shown, namely, ZG 61 A, *i.e.*, the alloy depending on $MgZn_2$ as hardening agent with the addition of Cr and Ti. The 1954 supplement lists three more alloys of this type: ZG 61 B, an alloy based on $MgZn_2$ as hardening agent, and both ZG 32 A and ZG 42 A which belong to the class making use of $Mg_3Zn_3Al_2$. One can probably conclude from this that the other alloys given in Table I are only of theoretical interest.

The mechanical properties at various temperatures may also be of interest. As an example, ZG 61 A has the following typical properties at room temperature:

Ultimate tensile stress:	15½ tons per sq. in.
0.2 per cent. proof stress:	11 tons per sq. in.
Elongation	5 per cent.

These vary with the temperature as follow:—

Temperature, deg. C.	Ultimate tensile stress, tons per sq. in.	0.2 per cent. proof stress tons per sq. in.	Elongation, per cent.
80	15	13¾	3
120	13	11½	2
175	8¾	7½	6
205	5¾	5	10½

The composition of the alloys shows that they are made of high-purity materials. Where copper is not a definite alloying element it is kept low, since it reduces the ductility and corrosion resistance. Silicon is probably the most important impurity and must be kept as low as possible, to avoid its combination with magnesium to form Mg_2Si. Iron tends to lower the ductility of the alloys, but its prescribed limits are not low in comparison with British specifications. The rôle of manganese does not appear to be clear, since it is being kept to very low limits in some alloys, but added as an alloying element to others.

Fluidity

The aluminium/zinc/magnesium alloys are not unduly difficult to cast, although they are not so fluid as the aluminium/silicon alloys, of course. Sections as thin as ⅛ in. have been produced successfully. Casting temperatures about 25 deg. C. higher than for aluminium/silicon alloys are recommended and more generous feeding arrangements will be found advantageous.

The advantages of these alloys lie in their unusual combination of properties. They possess high ultimate tensile and proof stress with good elongation without requiring any heat-treatment. They are easily machined and take a high polish; they are also easily anodized. Their corrosion resistance is said to equal that of any other aluminium alloy. They are dimensionally stable after natural or artificial age-hardening. Owing to the relatively high solidus temperature (572 deg. C.) they can be brazed successfully between 540 and 590 deg. C.; any loss in mechanical properties at the brazed joints will be recovered on subsequent ageing.

After about three weeks of natural ageing, the changes in mechanical properties become much less rapid, although they continue slowly for about a year. If it is desired to speed the natural ageing, this can be done by artificial ageing at 100 deg. C. (in boiling water) for eight hours.

In view of these advantages, the aluminium/zinc/magnesium alloys should be a useful addition to the range of alloys available to British founders to-day.

International Standards

Before concluding this short account of casting alloy specifications, mention must be made of the recent attempt to draw up international standards. The initiative came from a group of Continental countries who invited, amongst others, representatives of the USA, Canada and the UK. An international secretariat consisting of all participating standardization bodies was set up in Paris and, as an initial proposal, international standards for the following 15 alloys were put forward: LM.1; LM.4; LM.5; LM.6 (or LM.20); LM.7 (or LM.23); LM.8; LM.9; LM.10; LM.11; LM.12; LM.13; LM.14; LM.16; ASTM GZ 42 A; and ASTM ZG 61 A.

Thus, many specifications of the British standard would be covered by the international standards, although it will, of course, be appreciated that the international specifications are by no means identical

(*Continued on next page at foot of col.* 1)

More Fireplaces Recommended

Mr. Frank Skene, Bonnybridge, has drawn the attention of the Property and Buildings Committee of Stirling County Council to the difficulty experienced by tenants in council houses where only one fireplace has been installed. He suggested that strong representations be made to the Department of Health to permit of some improvement being carried out.

It was reported to the county council on January 27 that for a number of years it had been the policy, except in rural areas, to provide for cooking either by gas or electricity, there being no other heating unit in the kitchenette. It had also been the policy, on account of Department of Health regulations, to provide a fireplace in the living room only. Recently, the Department had relaxed restrictions to permit of a fireplace being installed in one of the bedrooms.

Various members stated that the present policy of not providing a heating unit in the kitchenette was most unsatisfactory and that it rendered the kitchenette liable to excessive dampness through condensation, and did not permit of the drying of clothes.

After discussion, it was agreed that the county architect should submit a report as to the possibility of effecting improvement on existing houses where only one fireplace had been provided and as to the most satisfactory heating system for future houses.

Disputes Worst in 1954

Some 2,470,000 working days were lost through disputes in 1954—more than in any other year since the war. Shipbuilding and repairing accounted for the loss of 522,000 working days, while 470,000 were lost in the coal-mining industry. During 1953, 2,180.000 working days were lost through disputes, the engineering industry being responsible for the loss of more than half.

Wage rates during 1954 rose by 4½ per cent. to 44 per cent. above the rate ruling in June, 1947. Retail prices rose by 4 per cent. to 45 per cent. above the 1947 base level.

A net pay increase of about £3,500,000 a week was received by over 10,000,000 workpeople during the year. One of the biggest increases in the weekly wage bill was recorded in engineering and shipbuilding, where about 2,500,000 workers received increases in April.

Aluminium Casting Alloys

(Continued from previous page)

with the British. The advantages of having an international standard would lie in the export field—where competition for aluminium-alloy castings would then start from the same basis—and in providing such international bodies as UN agencies or NATO with an agreed basis for any contracts which they may have to award.

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Hydro-electric Scheme for Argyll

The North of Scotland Hydro-Electric Board announce details of their Loch Glashan hydro-electric scheme, which will produce 17,600,000 units annually. The scheme provides for harnessing the waters of Loch Glashan, which lies north-east of Lochgilphead among the hills behind the hamlet of Lochgair on Lochfyneside in Argyll. The natural catchment area of the loch is 4 sq. miles; the rainfall on a further 20½ sq. miles of catchment will be utilized by means of diversion aqueducts.

The water will be collected behind a dam 1,100 ft. long and 45 ft. high, to be built at the outlet of Loch Glashan. From the dam, water will be led by a tunnel and pipeline 5,500 ft. long to a power-station with a capacity of 4,200 kw. situated on the shores of Loch Gair. The turbo alternator, which will operate under a head of 56 ft., will discharge into Loch Gair.

The Loch Glashan scheme is required to help meet the rapidly growing demand for electricity in the Kintyre and Knapdale areas; the scheme will meet this growth of load for a time, but already the Board's engineers are having to consider further reinforcement, which may be in the form of an extension of the Highland Grid from the Shira scheme, near Inveraray to Kintyre. The estimated cost of the Loch Glashan scheme is £1,300,000.

Scots Engineering Feat

Anderson-Grice, Limited, a Carnoustie engineering firm, has just completed construction of the world's largest stone-sawing machine. Its circular steel blades, 140 in. dia.. are 8 in. larger than the previous largest, made by a German firm. The machine will go to the South-Western Stone Company's quarries at Portland, Dorset. The saw carriage is mounted on an elevated gantry 40 ft. long. The machine is equipped with twin tables to carry a block of stone 12 ft. long, 5 ft. deep, and 6 ft. wide. The tables move in under the blade from either side so that when one block is sawn it is immediately withdrawn, and the other table moves in to ensure continuous sawing.

Round the edge of the saw blade are inserted 300 steel teeth. Each tooth carries a diamond weighing ¼ths of a carat. The circular steel blade was specially rolled by Colvilles, Limited, Motherwell. Because of transport difficulties, a team of expert sawsmiths from Spear and Jackson, Limited, Sheffield, went to Carnoustie to flatten the plates before the blade was machined by Anderson-Grice. They returned at a later stage to tension the blade. One of the numerous controls enables the operator to take repeated slices off a 25-ton block to an accuracy of $\frac{1}{16}$ in.

"Minibition" 1955

The Purchasing Officers' Association (now numbering nearly 4,000 members) is holding its sixth "Minibition" at the Winter Gardens, Cliftonville, from September 29 to October 1, in conjunction with its 1955 national conference. In the "Minibition" feature, exhibits are displayed on small stands of standard size and design and reach a very high standard, showing how well exhibitors can master the special technique necessary to make the best use of the limited space available. Although there will be room for more stands at Cliftonville than is usually the case, already most of the available space has been reserved. Firms interested in taking part are therefore advised to get in touch with the Association without delay.

"Pride in Achievement and Confidence in the Future"

Presidential Address by Mr. D. W. Berridge

At the opening meeting of the session of the East Midlands branch of the Institute of British Foundrymen, the new president, Mr. D. W. Berridge, presented his Address, in the course of which he dealt mainly with justifiable pride in foundry achievement and looked with confidence to the future. An extract from his remarks is printed in what follows:—

The making of castings goes back to prehistoric times, and the craft has grown in both quality and quantity until, with the introduction of the machine age in the last century, castings became the key product in the advancement of industry. So much so that many of the earlier machines were made up almost entirely of castings. It is a great tribute to the skill of the craftsmen and foundry technicians of those days that some of these machines are still in working order to-day. With the advent of steel, and later alloy steels, the designers were able to subject their machines to much greater stresses, thus leading to increased demands for greater output from them, and consequently, also, for greater strength in the castings, particularly for the moving parts. The history of industrial growth in our country has shown that the foundrymen of those days applied themselves diligently to the task of improving their products. The foundries were mostly family concerns, facilities for travel were limited, so that opportunities for advancing their technique were small and localized. Organized research as it is now known was practically non-existent.

Pooling of Ideas

It is not surprising, therefore, that soon after the beginning of this century, a number of foundrymen decided to get together and pool their ideas, and so this Institute was born. This pooling of ideas has been one of the chief objects of the Institute ever since, because no matter how clever an individual may be, he can always learn something from his fellow men. A foundryman, above all others, will be the first to admit this, which is the reason for the ever-increasing membership of the Institute to-day. Whilst the Institute has no research establishment of its own, one of its functions is to investigate, and make available to its members, the results of the researches of others in a practical form which can be understood by all. It is essentially a technical Institute, having no concern with the commercial side of our business, only with the improvement of our products. It is gratifying to know that the foundry industry has thus been able to keep pace with the tremendous advances of the past 50 years, and is still able to supply the highest demands of the engineer or the scientist.

Design

I heartily endorse all that our President, Mr. John Bell, said in his presidential address last June, regarding design of castings. Whilst I feel that we should consider it a great compliment to our abilities that designers spend many hours creating their masterpieces, which tax our skill and ingenuity to the utmost, I do feel that there could be considerable simplification of many castings, with advantage to the engineer and the foundryman. There are voluminous handbooks for the engineer covering every conceivable aspect of their industry, but few contain any reference to features of design of castings which will allow proper fixing and venting of cores, positioning of webs and bosses to avoid hot spots, and many other aspects so important to the making of a sound casting. It is mostly in the books and journals for foundrymen that these things are referred to and this seems to me to be the wrong approach, since I suspect that few engineers are in the habit of reading foundry literature. It might be worthwhile at some time in the future to invite an engineer to come along and tell us what he expects from his castings.

Patternmaking

Whilst on the subject of design, I would like to pay tribute to the patternmaker. The successful patternmaker to-day must not only possess the skill and knowledge to translate the ideas of the designer (not always clearly shown) into a workable pattern, but must be a skilled engineer and metalworker also. Some of the patternmakers' products are masterpieces of craftsmanship. I would make one plea to them, however, as a jobbing foundryman, for them to supply no more unvarnished patterns (even for one-off jobs), and for rapping plates to be fastened to some solid parts of the patterns. I would make a further plea, this time to our foundries, particularly jobbing foundries, to pay more attention to the care of patterns. Let us remember that they are a valuable and essential part of our equipment, are usually the property of our customers, and it is our duty to protect their property. It is important for our own sakes also, as a much better casting can be produced from a well-kept pattern than from a battered mass of timber.

Role of Castings

In the training of apprentices, I feel that we do not lay sufficient emphasis on the importance of the finished product. We should be prepared to give more explanations as to the ultimate destination and uses of the castings a boy is helping to produce, and where possible let him see them working on the machines of which they form a part. All too

"*Pride in Achievement and Confidence in the Future*"

often we despatch our castings and do not give sufficient thought ourselves to the important functions they are going to fulfil in the pattern of our lives, by helping to provide comforts or necessities. If we who have been in the industry for many years cannot lift the veil occasionally and see beyond the smoke and grime of our foundries, how can we expect young people to see what a vital part the foundry craft plays in our everyday lives. The problem of recruitment is not a new one, it was with us twenty years ago, but foundries are still functioning and producing more and better castings than ever before. There is no room for complacency here, however, as much of this is due to mechanization and the use of mechanical aids which allow founders to make better use of the skill of the craftsmen.

The Future

The demand for more and better castings is greater than ever before, and it is hoped it will continue to be so. Even if the atomic age is just around the corner, I am confident that castings will still play an important part in the scheme of things, as being the quickest and most economical way of producing an article from raw materials. Let us feel proud, and show our pride, that we belong to an industry which does not know its own beginnings, but which has marched forward and kept its place in the forefront of world production, and has never failed to produce all that has been asked of it.

In future years, we shall probably be obliged to use inferior materials, but helped and guided by the pooling of our knowledge and ideas, and by the Institute in the interpretation of the work of foundry scientists, we shall continue to improve castings, as we always have done. There are still many things to be learned about the processes involved in the making of castings, more efficient uses to be made of raw materials. Greater efficiency is needed from melting equipment, especially the cupola, bearing in mind that the quality of coke is likely to deteriorate during the next few years. Better ways of ramming sand into large moulds must be sought to eliminate as much as possible of the hard work necessary in this operation. We must do everything in our power, from the youngest apprentice to the highest executive to reduce the number of wasters (a very apt term) which are produced. I am sure that the Institute, and this branch in particular, will always have the full support of every thinking member of the industry in carrying out these tasks.

Instability of Testing Machines

A paper on the above subject by A. H. Chilver, B.Sc., Ph.D., presented to the Institution of Mechanical Engineers is concerned with the stability of compression- and tension-testing machines. It is demonstrated that the buckling of a simple testing machine may be treated as an elementary problem in elastic stability. The Author summarizes his conclusions in the following statement:

Compression Machines. A simple compression machine may be a highly unstable structure at relatively-low working loads; this is confirmed by tests on model and full-size machines. For specimens compressed between knife-edges or ball-ends the stability of the machine as a whole may be ensured if the specimen is at least as long as the connecting ties. For shorter specimens the machine may become unstable at loads less than the full capacity of the machine. The stability of a compression machine is improved if the head of the machine is restrained elastically against lateral movement. For a compression test specimen with encastré ends the stiffnesses of the connecting ties may be chosen so that premature buckling of the machine is avoided.

Tension Machines. In tension machines the stability of the specimen itself is unimportant. The mode of instability may involve lateral movements of the cross-head; in this case it is important to have a knowledge of the extent to which the connecting struts are laterally restrained at their supports.

BRITISH RAILWAYS PADDLE STEAMER, the Marchioness of Lorne, 427 tons, built by the Fairfield Engineering Company, Glasgow, in 1935, is to be broken up. The salvage department of the BISF has stated in a letter received on February 11, by the firm of Smith & Houston, that the vessel has been allocated to them for breaking up.

Instrumentation and Fuel Efficiency

Eight out of the 32 member-firms of the British Industrial Measuring and Control Apparatus Manufacturers' Association (BIMCAM, for short) staged a demonstration for the Press at the Waldorf Hotel, London, last week, of instruments and equipment designed to assist industry in the war against "smog." Officials of the association were supported by engineers of the National Industrial Fuel Efficiency Service (NIFES) in explaining the value of the equipment displayed in various applications for reducing smoke and fume emission and at the same time increasing fuel efficiency—objectives by no means synonymous. The displays mainly concerned boiler plant—draught gauges; CO_2 and flue-gas indicators and recorders; smoke-density alarms, and the like—but many of the instruments could well be (and, indeed, some are) applied to foundry melting furnaces, annealing and drying stoves, core-ovens, etc.

It was impressed on the assembly that firms would be wise to anticipate statutory factory legislation, by putting-in control apparatus right away. The quotation "The average efficiency of all boiler plants using over 40 tons of coal per week is not more than 65 per cent. With correct operation and the use of instruments, this figure could be raised to 72 per cent., which would mean saving 10 per cent. of the coal fired on these boilers. This automatically means a 10 per cent. reduction in smoke and grit, apart from the reduction which follows from better combustion" could probably be related with much truth to foundry fuel-consumption. As everyone nowadays is interested in fuel economy, instrumentation can obviously assist founders in this direction.

SHORT BROS. & HARLAND, LIMITED—Mr. H. G. Conway, chief engineer, has been appointed a director.

New Equipment

Oil-burning Equipment

Lees Hall & Sons, Limited, of Lewes Road, Newhaven, Sussex, have designed and placed upon the market a new type of oil-burning equipment for use in furnace practice, especially crucible furnaces. The new burner is characterized by the introduction of the fuel oil at right angles to the air stream. Thus, the air and oil are atomized within the furnace combustion chamber and not, as normally, atomized in the oil burner prior to being injected. This is claimed to have the effect that before the air stream hits the oil it is preheated, because the whole combustion chamber soon becomes white hot. Moreover, the oil itself is preheated before being atomized. The general arrangement of the plant is shown in Fig. 1, where the air supply enters at A and the oil by the pipe B to the jet. The air supply is at a pressure of about ¾ lb. per sq. in.

The physical appearance of the apparatus is shown in Fig. 2. The consumption of fuel oil on a recent test was of the order of 1¼ gall. per 200 lb. of bronze, cast at about 1,000 deg. C., the tests being carried out in the furnace shown. The melting time for the case cited was 40 min.

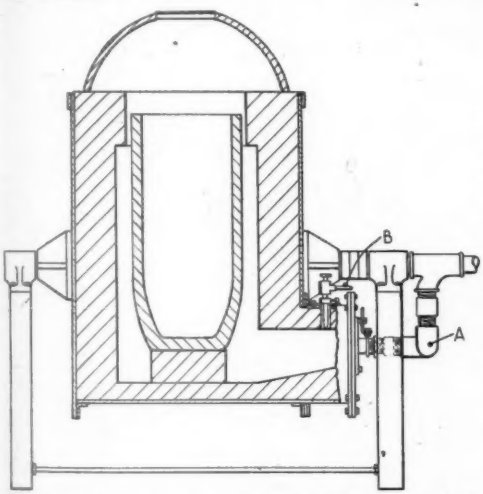


FIG. 1.—*Diagram of the Lees Hall burner applied to a crucible melting furnace.*

The new burner system has been fitted to reverberatory and tilting furnaces alike, with, it is claimed, substantial improvement, especially for high temperatures. The following additional figures on melting times for this new system are quoted:—For lift-out furnaces, the melting time for copper up to 200 lb. capacity—30 min.; for tilting furnaces, the melting time for copper up to 1,000 lb. capacity—45 min.; and for reverberatory furnaces, 2 tons capacity—1 hr. 30 min., oil consumption 12 galls. (approximately 6 galls. per ton on continuous working). All melting times include raising the metal to casting temperatures, and not just to melting point.

Shell-moulding Pattern Accessories

A leaflet from Shallway Corporation, South Fourth Street, Connellsville, Pa., U.S.A., illustrates a line of

(Courtesy, Diecastings Limited)

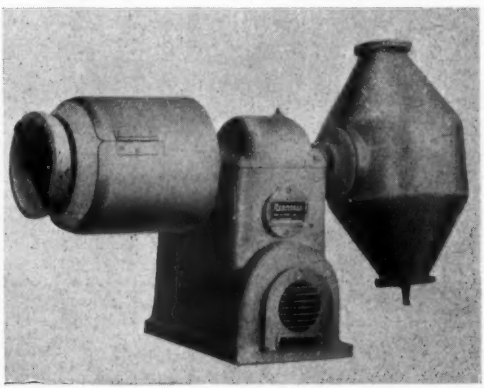
FIG. 2.—*New oil-burner system applied to a lift-out crucible furnace.*

master heater plates, insert patternplates, electric-heater elements, springs, locator buttons and the like, all for shell moulding. Stocks of these are carried by the firm's agents throughout the States.

Multi-duty Mill

Podmores (Engineers) Limited, Shelton, Stoke-on-Trent, have recently designed a multi-duty mill which is illustrated in Fig. 3. Available with the machine are five quite different types of interchangeable bodies which permit the machine to be used for the wet grinding of enamel frit, for dry grinding, for wet and dry mixing, and for polishing (an octagonal body). The flexibility of the machine commends itself for laboratory use.

FIG. 3.—*Podmore multi-duty mill, equipped with the porcelain grinding pot and double conical dry-mixer attachments.*



British Blast Furnaces in the December Quarter, 1954

(These tables are published through the courtesy of the British Iron and Steel Federation.)

Derbyshire, Leicestershire, Notts, Northants, and Essex.

Name of firm.	In blast at end of the fourth quarter, 1954.					Weekly average in blast.	Total existing at end of quarter.
	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.		
Clay Cross	—	—	1	—	1	1	2
Ford Motor	1	—	—	—	1	1	1
Holwell Iron	—	—	3	—	3	3	4
Kettering Iron & Coal	—	1	1	—	2	2	2
New Cransley Iron & Steel	—	—	1	—	1	1	2
Renishaw Iron	—	—	2	—	2	1.7	2
Sheepbridge	—	1	1	—	2	2	2
Stanton Ironworks: Stanton-by-Dale	—	—	4	—	4	4.3	5
Staveley Iron & Chemical	—	—	4	—	4	3.8	4
Stewarts and Lloyds: Corby	—	4	—	—	4	4	4
Wellingboro' Iron	—	2	—	—	2	2	3
TOTAL	1	8	17	—	26	25.8	31

Lancashire (excl. N.-W. Coast), Denbighshire, Flintshire, and Cheshire.

Brymbo Steel	—	1	—	—	1	0.8	1
Darwen & Mostyn	—	—	—	1	1	1	1
Lancashire Steel Corp'n.	—	2	—	1	3	2.2	3
Summers, J.	—	1	—	—	1	1	1
TOTAL	—	4	—	2	6	5	6

North-West Coast.

Barrow Ironworks	2	—	—	—	2	2	4
Charcoal Iron	—	—	1	—	1	0.6	1
Millom & Askam	2	—	—	—	2	2	3
United Steel: Workington	2	—	—	1	3	3	3
TOTAL	6	—	1	1	8	7.6	11

Lincolnshire.

Appleby-Frodingham	—	4	—	—	4	4	6
Lysaght's Scunthorpe Works	—	3	—	—	3	3	4
Thomas, R., & Baldwins: Redbourn	—	2	—	—	2	2	3
TOTAL	—	9	—	—	9	9	13

North-East Coast.

Consett Iron	—	3	—	—	3	3	3
Dorman, Long: Acklam	—	2	—	—	2	2	4
Redcar	—	2	—	—	2	2	2
Cleveland	—	2	—	—	2	2	4
Bessemer	—	2	—	—	2	2	3
South Bank	—	—	—	2	2	2	3
Gjers, Mills & Co.	2	—	—	—	2	2	5
Normanby Ironworks	2	—	—	—	2	2	3
Skinningrove Iron	—	1	—	—	1	1	3
South Durham Steel & Iron:							
West Hartlepool	—	2	—	—	2	2	2
Cargo Fleet	—	2	—	—	2	2	2
TOTAL	4	16	—	2	22	22	34

Scotland.

Bairds & Scottish Steel: Gartsherrie	1	1	1	—	3	3	5
Carron	—	—	1	—	1	1	4
Colvilles: Clyde Works	—	3	—	—	3	3	3
Dixon's	—	2	—	—	2	2	6
TOTAL	1	6	2	—	9	9	18

South Wales and Monmouthshire.

Briton Ferry Works	1	—	—	—	1	1	1
Guest Keen Iron & Steel: Cardiff	1	2	—	—	3	3	4
Thomas, R., & Baldwins: Ebbw Vale	—	2	—	—	2	2	3
Steel Company of Wales: Margam	—	3	—	—	3	3	3
TOTAL	2	7	—	—	9	9	11

Pollution Appeal Dismissed

The Court of Appeal dismissed the appeal of the Consett Iron Company, Limited, against a decision by Mr. Justice Danckwerts on October 22, refusing to stay on the grounds of alleged maintenance by the Anglers' Co-operative Association and the A.C.A. Trustee Company, Limited, an action by Mrs. Laline Marguerite Lucie Martell, a riparian owner, and the trustees of the Derwent Angling Association for the alleged pollution of the River Derwent.

Lord Justice Jenkins said he would hold that an association of a number of persons individually interested, as riparian owners or holders of fishing rights, in the preservation from pollution of the waters of various rivers in different parts of the country could, without being guilty of the crime or tort of maintenance, support with any funds at their disposal actions brought by individual members to restrain the pollution of rivers to which their interests related. It was reasonable to include as a proper participant in such an organization anyone who had in relation to some river such an interest as would justify him individually in lending financial support to restrain the pollution of that river, as, for example, the proprietor of an hotel near a good fishing river, depending for his custom on people coming to fish in the river, who might be ruined if the fishing was spoilt by pollution. It would be ridiculous if the law held such a man guilty of a crime for supporting an action to stop a state of affairs which was depriving him of his livelihood.

Fined for Scrap Price Offences

At the London Sessions, Mayer, Newman & Company, Limited, dealers in scrap metal, of Arundel Street, Strand, W.C.2, was fined £2,250 with £105 costs for offences against the Iron and Steel Order, 1952, under the Defence Regulations, 1939. The company had pleaded Guilty to two indictments containing a total of 45 counts of selling heavy steel scrap in excess of the maximum price to the Glanmor Foundry Company, Limited, Llanelly (Carms).

Mr. Edward Clarke, prosecuting for the Ministry of Supply, said that Mayer, Newman & Company had charged the correct price for scrap, but had added the cost of carriage to the invoice. The cost of the carriage brought the total charge above the maximum. The amount overcharged was £948 7s. 1d. on about 500 tons of scrap metal.

The Glanmor Foundry Company had left itself open to prosecution because it was just as much to blame as the sellers, Mr. Clarke said. In the circumstances the Ministry of Supply had sent the firm a warning letter.

Before imposing the fine, the judge said that he did not regard it as a serious matter.

Production-scale Vacuum Casting of Steel

A new degassing process for high-grade alloy steels has been developed at the German Bochumer Verein works at Bochum, under the direction of Dipl. Ing. Arthur Tix. This process has been introduced in order to overcome the difficulties encountered during the forging of alloy steels, particularly the embrittlement which can be traced to the presence of hydrogen, giving rise to hair-line cracks and similar defects. Casting steel in vacuum on a commercial scale is now being practised. Casts of up to 150 tons in weight are being treated in a sealed mould, eliminating hydrogen and many of the inherent troubles of absorbed gases. The first illustrated description in Britain of this process appears in the February 4 issue of our sister journal *Iron and Coal Trades Review*, by special arrangement with Gussstahlwerk Bochumer Verein A.G.

THE COUNCIL of the Institution of Electrical Engineers has elected the Duke of Edinburgh to honorary membership of the Institution. The Duke has signified his acceptance of the election.

British Blast Furnaces in the December Quarter, 1954—*continued*

Staffordshire, Shropshire, Worcestershire, and Warwickshire.

Name of firm.	In blast at end of the fourth quarter, 1954.					Weekly average in blast.	Total existing at end of quarter.
	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.		
Goldendale Iron	—	—	1	—	1	1	2
Lilleshall	—	—	1	—	1	1	2
Round Oak Steel Works	—	—	—	—	—	—	2
Shelton Iron, Steel & Coal	—	3	—	—	3	2.8	3
Stewarts and Lloyds: Bilston	—	3	—	—	3	2.4	4
TOTAL	—	6	2	—	8	7.2	13
Sheffield.							
Park Gate Iron & Steel	—	2	—	—	2	2	2
GRAND TOTAL	14	58	22	5	99	96.6	139

Weekly Average Number of Furnaces in Blast during the December Quarter, 1954, and the Previous Four Quarters

District.	1953.	1954.			
	Dec.	March.	June.	Sept.	Dec.
Derby, Leics., Notts., Northants, and Essex	26.9	26.2	25.8	24.2	25.8
Lancs. (excl. N.-W. Coast), Denbigh, Flint, and Ches.	5.9	6	6	4.2	5
Lincolnshire	12	11.2	10.3	9.3	9
North-East Coast	24.7	25	25	22.9	22
Scotland	9	9	9.1	9	9
Staffs., Shrops., Worcs., and Warwicks.	9	9	8.5	8.6	7.2
S. Wales and Monmouth	9	8.9	9	8.7	9
Sheffield	2	2	2	2	2
North-West Coast	8	8	7.5	7	7.6
TOTAL	106.5	105.3	103.2	95.9	96.6

The following companies have furnaces in course of construction or rebuilding:—Darwen & Mostyn Iron; John Summers: Dorman Long (Steel) (3); Lancashire Steel Corporation; South Durham Steel & Iron (West Hartlepool and Cargo Fleet); Steel Co. of Wales; Renishaw Iron.

Payments from Turkey

United Kingdom exporters or merchants are invited by the Board of Trade to supply by February 21 certain details of each shipment of goods to Turkey for which sterling payment has been outstanding since before January 1, 1953. This is in connection with the Anglo-Turkish agreement concluded recently on the settlement of outstanding sums owed by Turkey to UK merchants and exporters. An announcement will be made later about arrangements for obtaining information on payments outstanding since dates later than January 1, 1953.

There are at present held in Turkish customs warehouses certain goods which were shipped to Turkey by UK exporters or merchants against orders from Turkey, but for which the Turkish importer was not successful in obtaining an import authorization. The Turkish Government has now undertaken that such goods will be imported into Turkey on a preferential basis as soon as arrangements are made for the imports of goods of those particular types. The UK authorities have undertaken to provide a list of such goods for the information of the Turkish authorities.

AT THE British Plastics exhibition and convention to be held at Olympia, London, June 1 to 11, 1955, the only paper of direct foundry interest is "Recent Developments in the Use of Plastics in the Foundry" by P. G. Pentz, B.Sc., technical sales manager, Leicester, Lovell & Company, Limited.

Parliamentary

Clean Air Bill

As soon as consultations with those affected, including industry and local Government, have been completed, the Government is to frame and introduce a comprehensive clean air Bill, including the financial provisions needed to make it effective. This was announced by MR. DUNCAN SANDYS, Minister of Housing and Local Government, in the House of Commons on February 4, after the House had been discussing a private Bill presented by MR. GERALD NABARRO (Con.). The Minister said that the Government's Bill would be introduced in the present Parliamentary session.

Moving the second reading of his Clean Air Bill, Mr. Nabarro said that the Beaver Committee had estimated that the cost of smoke pollution to the nation was £250,000,000 a year. The Bill, if implemented in full over 10 to 15 years, would cost the nation in terms of capital investment £50,000,000 a year. One international organization had said that Britain burned coal more wastefully than any other nation.

Innumerable lives were lost by intense smoke pollution of the atmosphere year by year, Mr. Nabarro continued. He disputed that the cost of smoke reduction to private industry would require any subsidy. Fuel conservation was in itself a sound investment. In the event of the Government giving an assurance that it would introduce in this session a comprehensive measure he and his colleagues would be prepared to withdraw the Bill. But it was their aim to have this matter on the Statute Book before the end of the session.

Human Cost of Coal

MR. ALFRED ROBENS (Lab.) said that it was criminal that coal should be wasted when it cost so much in human life and suffering to produce. If the Minister could say he would introduce a comprehensive Bill, it would have the blessing of the Opposition, which would do all it could to expedite the passage of the Bill through the House.

The rejection of the Bill was moved by DR. BARNETT STROSS (Lab.), who said that it did not go far enough. Mr. Nabarro should withdraw it, but only on the condition that the promise the Minister had given on January 25 was again offered to the House, and that at the earliest moment a Bill would be brought in.

MR. HIGGS (Con.) said he had an instinctive reaction against a Bill which invaded people's homes, and condemned them eternally to gas or electric fires or the burning of non-existent smokeless fuels. For a second offence of burning coal, a householder might be punished by six months' imprisonment or a fine of £500: that was a maximum penalty, but to impose it in Britain wanted careful scrutiny and substantial justification.

MR. SANDYS said that if the new law was to be knowledgeable, practical, and reasonable it must be devised and framed in close consultation with those who were going to be most practically affected. In particular there must be full consultations with local authorities, with industry, both employers and trade unions, and with the various technical boards whose advice was needed. These consultations had already started, were going ahead satisfactorily, but were not yet complete.

In the light of these circumstances the Government had considered whether it could advise the House to adopt the text of the Bill and had, reluctantly, come to the conclusion that it could not do so. The reasons were that the drafting of the Bill differed from the Beaver Committee's recommendations in ways which would present serious difficulties and was, of necessity, drafted without full consultations with industry and local authority. The Bill did not and could not contain the financial provisions necessary to make it fully effective.

In all the circumstances he felt, and judging by the debate even those supporting the Bill felt, that it would be better, and avoid the risk of confusion, to have a Government Bill. As soon as the consultations he had mentioned were concluded the Government would frame and introduce a comprehensive measure.

That Bill would follow the general lines of the Beaver report, but that would not preclude the Government from considering additional or alternative proposals. He could make no promise about the date of the introduction of the Bill, except that there would be no avoidable delay, and that it would be introduced this session.

In view of the Minister's announcement, MR. NABARRO asked leave to withdraw his Bill. Leave was granted, and the Bill was withdrawn.

Nickel Supplies

In consultation with industry, consideration had been given to ways of helping to overcome the shortage of nickel, and steps were being taken which should reduce the expected shortage during 1955, said MR. THORNEYCROFT, President of the Board of Trade, in a written answer to MR. CARR.

MR. THORNEYCROFT said that supplies of nickel were still, however, unlikely to be sufficient to meet demand, and, while no doubt all concerned would do their utmost to increase them, it would be necessary to economize in the use of nickel for some time to come.

Steel Output Records

With a weekly average of 380,600 tons in January, the steel industry established a new record in the first month of the year. The previous highest output was achieved last November, when the output was 377,000 tons a week. Production in January, 1954, averaged 360,300 tons a week. Last month's annual rate of 19,789,000 tons compared with 19,606,000 tons last November and 18,737,000 tons in the opening month of last year.

Pig-iron production averaged 236,400 tons a week in January, and this was also a record, the previous best—in November, 1954—being 235,300 tons.

Latest steel and pig-iron-output figures compare as follow with earlier returns:—

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
	Tons.	Tons.	Tons.	Tons.
1955—January ..	236,400	12,292,000	380,600	19,789,000
1954—January ..	229,600	11,941,000	360,300	18,737,000
November ..	235,300	12,236,000	377,000	19,606,000
December ..	233,600	12,149,000	354,700	18,442,000
1953—November ..	228,500	11,883,000	363,000	18,878,000
December ..	225,400	11,723,000	338,900	17,624,000

Conference on Ventilation and Lighting

The British Cast Iron Research Association is organizing a conference on Ventilation and Lighting. This is to be held at the Hotel Majestic, Harrogate, on April 27 to 29. The object of the conference is to review progress made in the study of foundry ventilation, dust control, and related subjects. The fact that new regulations come into force on January 1, 1956, lends importance to this subject.

News in Brief

SHEFFIELD JUNIOR CHAMBER OF COMMERCE is examining the possibility of holding a Sheffield Trade Fair along the lines of the BIF.

BRITISH TRANSPORT COMMISSION announce that a contract has been placed for 111 fifty-ton rail, sleeper and ballast wagons, with Head, Wrightson & Company. Limited, Thornaby-on-Tees.

A NEW Scottish company, Lochee Engineering Company, Limited, ironfounders, textile and mechanical engineers, etc., has been formed. John Miller and Binnie E. Miller, both of Dundee, are directors.

A SURVEY of the district surrounding the James Bridge Copper Works is to be made by Walsall's Chief Sanitary Inspector. The action follows a town council deputation of residents who complained of dirt and noise from the works.

SHALLWAY CORPORATION, Connellsville, Pennsylvania, USA, announce the arrival of what is claimed to be the first American-made shell-moulding machine in Germany. It is to be installed in the foundry of Eisenwerke Melderich A.G., of Mullheim.

AT A MEETING of the East and West Ridings Regional Board for Industry in Leeds, on February 8, it was revealed that the Bradford engineering firm of Hepworth & Grandage, Limited, makers of piston rings, had been granted an industrial development certificate for an addition of 130,000 sq. ft. to their factory.

A NEW COMPANY, R. L. Engineers, Limited, with a nominal capital of £100,000 is being formed by the Rootes Group and R. A. Lister & Company, Dursley, the parent company of Blackstone & Company, Limited, of Stamford. The new company intends to prevent overlapping in the production of diesel engines.

NEARLY 300 manufacturers have stands at the annual British Furniture Exhibition, which opened to the trade at Earls Court, London, on Monday, February 14, and admits the public on Saturday, February 19. Times for public admission are 10 a.m. to 9 p.m. on Saturday, February 19, and 2 to 9 p.m. from February 21 to 24, the closing day for both trade and public.

BRITISH INSULATED CALLENDER'S CABLES, LIMITED, are exhibiting on their stand at the German Industries Fair, Hanover, a wide range of cables, including impregnated pressure and oil-filled high-voltage cables, mass-impregnated non-draining cables, rubber and thermoplastic cables, trailing cables for mines and quarries, telephone cables, television-camera cables and couplers and television downlead cables.

HEAD, WRIGHTSON MACHINE COMPANY, LIMITED, of Middlesbrough, announced on February 2 that it has gained an order from Richard Thomas & Baldwins, Limited, for the installation of a continuous strip-galvanizing line at the Ebbw Vale works. The order is valued at £600,000 and the plant is expected to go into production early in 1957, and will be the first of such a size to be installed in the country.

BRIDLINGTON TOWN COUNCIL decided on February 4 to seek permission to borrow nearly £30,000 to build a factory on the industrial estate in order to gain a new industry (motor engineering) for the town. The Mayor, Councillor H. J. Dean, said a company would be formed in the near future, and would eventually employ about 150 people. The factory would have a floor space of 15,000 sq. ft., with provision to double it.

STANDARD MOTOR COMPANY, LIMITED, of Coventry, has acquired a controlling interest in the old-established Dublin firm of McEntagart Bros. Mr. Alick S. Dick, Standard's managing director, will be chairman of the new company. McEntagart Bros. has represented the Standard Motor Company, Limited, and has been responsible for assembling Standard cars in Dublin since 1930. The company will continue to operate as before.

AT DERBY on February 2, Mr. Francis Ley, managing director of Ley's Malleable Castings Company, Limited, and Ewart Chainbelt Company, Limited, presented eight framed long-service certificates, together with £10 each to employees who in 1954 had completed 40 years' service with the companies, and 52 clocks and watches to those who had been with them 21 years. The companies have now presented 273 certificates for 40 years' and 1,326 clocks for 21 years' service.

SPEAKING AT THE ANNUAL DINNER of the Wolverhampton branch of the Industrial Transport Association on February 5, Mr. J. Churm, Transport Manager of Joseph Sankey & Sons, Limited, said he believed that when the British Transport Commission's revised scale of rail freight-charges was published, big increases would be embodied. Mr. Churm referred to a " minor revolution in transport taking place at this moment " with proposals for modernizing both railways and roads.

ACCORDING to *Gray Iron News*, the organ of the (American) Gray Iron Founders Society, despatches of grey iron castings in America in September last amounted to 921,000 short tons (1 per cent. below August despatches) but 17 per cent. below the September, 1953, level—from figures issued by the Bureau of the Census, Department of Commerce. Unfilled orders for grey-iron castings totalled 861,000 tons at the end of September, a decrease of 26 per cent. from the corresponding total at the end of September, 1953.

GRIFFIN & GEORGE, LIMITED, laboratory furnishers, announce that a new company, Grundy Equipment, Limited, has been formed in close association with Grundy (Teddington), Limited, metal workers and engineers. This step has been taken to meet a growing demand for all-metal unit furniture and service pipework for laboratories. Griffin & George will act as sole selling agents for the new company which will concentrate on production in the Teddington works until arrangements have been completed for a new factory.

A SPECIAL TRAIN left Parkhead, Glasgow, on February 6 for Berwick, conveying a 96-ton cast-steel rolling-mill housing on the first stage of its journey to Darnall, Sheffield. The housing, which is 23-ft. 6-in. long, 12-ft. high, and 8-ft. 4½-in. wide, is the second of four which William Beardmore & Company, Limited, are casting at their Parkhead steel works. After finishing treatment by the Davy & United Engineering Company, Limited, Sheffield, they will be installed in the Ebbw Vale steel works of Richard Thomas & Baldwin, Limited.

AT THE ANNUAL GENERAL MEETING of Stewarts and Lloyds, Limited, Mr. A. G. Stewart, the chairman, told shareholders that the company, in conjunction with the Tata Iron & Steel Company, Limited, was erecting a continuous weld tubemaking plant at Jamshedpur, in India. The plant, he said, would be owned and operated by the Indian Tube Company (1953), Limited—in which Stewarts and Lloyds had a 40 per cent. interest and Tata the remaining 60 per cent.—and was expected to come into operation towards the end of 1955.

VIGOROUS TIMES for the motor industry were forecast on February 1 by Mr. J. F. Bramley, sales director of

News in Brief

the Austin Motor Company when he spoke at the annual dinner of the West Midland Division of the Motor Agents' Association. He predicted that the output of 1,000,000 vehicles in 1954 would be raised to 1,200,000 vehicles in 1955. Export markets had so far taken 50 per cent. of the output and he thought that would be continued in the future. Compared with 1938 the trade sold 114,000 more cars in Britain in 1954 and 30,000 more goods vehicles.

LEAMINGTON MAGISTRATES fined Sidney Flavel & Company, Limited, gas-appliance manufacturers, etc., of Clarence Street, Leamington, £50 when the company pleaded guilty to allowing a pneumatic press to be used with insufficient fencing. Mr. H. Entwhistle, prosecuting, said the press was used for fixing lids to ammunition boxes. The girl working the machine found a shutter which would minimize danger was missing. She reported it, but nothing happened. Later her fingers were caught and smashed.

MR. WILLIAM LYONS, managing director of the Jaguar Car Company, said on his return to this country on February 5 after a visit to the United States, that he intended to see if his factory could increase production by 40 per cent. to meet American demands. "We feel we have only touched on the fringe of the potential market over there," he said. Between 4,000 and 5,000 cars (almost 40 per cent. of the firm's annual output) were already being exported to the American market. This number would be increased to between 6,000 and 7,000 cars a year to meet the new demands.

MR. W. MORLAND FOX, joint managing director of W. J. Jenkins & Company, Limited, gas plant manufacturers, of Retford, Notts, will travel to South Africa in April for the official inauguration of a new gasworks at Port Elizabeth. The firm has just completed a £145,000 contract for the construction of the major section of the works. A large part of the manufactured items were produced at the Beehive Works, Retford, and the remainder was made in South Africa from designs supplied from W. J. Jenkins & Company. The firm also supplied the supervisory staff for the constructional work.

THE WEST HARTLEPOOL steelworks of the South Durham Steel & Iron Company, Limited, brought into use on February 2, the first unit of a new ore-preparation plant designed to assist in the doubling of pig-iron output. The new section has taken two and a half years to construct. Machinery to handle, grade and crush the ores includes 3,000 ft. of conveyor belting, and the stockyards will contain up to 100,000 tons of prepared ores ready for use; 400 tons of material an hour can be handled by the plant and in an ordinary day-shift it will be possible to receive at the blast-furnace bunkers as much ore, properly graded, as was originally handled in 24 hours.

THE FOURTH CONFERENCE of the British Occupational Hygiene Society, devoted to a discussion on the assessment of health and disease in industry, will be held at the London School of Hygiene and Tropical Medicine on Monday, April 4, at 11 a.m. The principal speakers will be Dr. D. Stewart, chief medical officer, Austin Motor Company; Dr. R. Murray, HM Medical Inspector of Factories; Dr. R. McL. Archibald, medical officer, N.E. Division, National Coal Board; and Prof. A. Bradford Hill, London School of Hygiene and Tropical Medicine. Further particulars can be obtained from the hon. scientific secretary, D. G. Harvey, MRC Laboratories, Holly Hill, Hampstead, London, N.W.3.

BRONZE SAND CASTINGS made by Mr. W. J. Crosbee Franklin at the small factory of Franklin Bros., Birmingham, were displayed last week for inspection by a party of planning and re-development experts from Coventry who were returning a visit paid by the Birmingham Estates Department representatives. The works of Franklin Bros. was included in the visit because they come within a re-development area and typify the "one-man" concern which maintains a craftsman's standards. Mr. Franklin assembled for display a collection of castings which included animals ranging from small elephants to race horses, which are due to be exported to Greece, badges for motor clubs and the like.

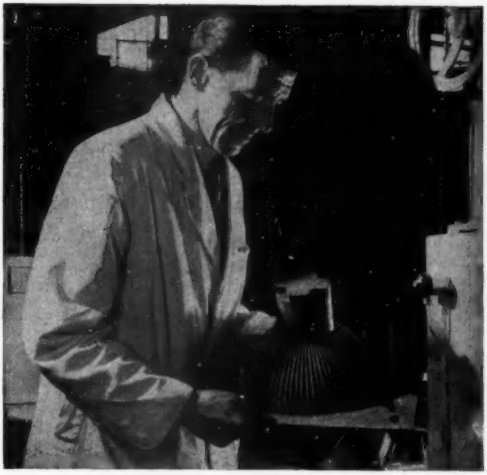
VONO INDUSTRIAL PRODUCTS, LIMITED, gave a luncheon on February 4, at the Municipal Buildings, Old Hill, to local members of the Civic Heads Association and their wives. Guests were received by the Mayor and Mayoress of Rowley Regis and by Mr. W. L. Barrows, managing director of the company, and Mrs. Barrows. Mr. Barrows said that the area had enjoyed for a long time an exceptionally high level of employment and expansion by the Vono Group, and its widening spread of interest would, he hoped, carry that state of affairs into the future. Founded by the late Mr. Ernest Vaughan in 1895, the first extension of the firm's activities into Rowley Regis was the Duport Foundry in 1912. It has been continuously expanded.

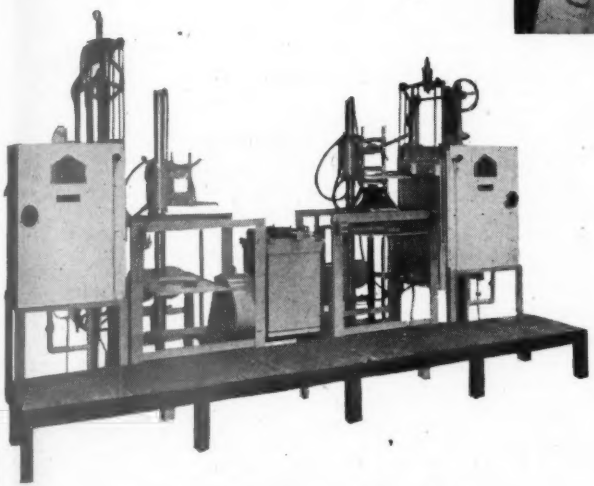
FROM FEBRUARY 14-28 an exhibition devised by the Isotope Division of the Atomic Energy Establishment at Harwell is being held at the Birmingham Exchange and Engineering Centre and some of the newest industrial uses for atomic energy will be demonstrated. A number of firms which manufacture equipment for work with radioactive isotopes are taking part. Among the techniques being demonstrated are the use of isotopes as substitutes for X-rays in the examination of castings; thickness gauges which can maintain a continuous measurement of the thicknesses of metals; the measurement of leaks from water-pipes and fuel lines and improved methods of checking the efficiency of liquid or gas filters. One working demonstration shows how wear on bearings or moving parts can be measured in a few hours without having to dismantle a machine. Many hours of running have been necessary before wear could be measured by weighing or micrometry. The exhibition was opened by Dr. Henry Seligman, director of the Isotopes Division at Harwell.

TECHNICAL SKILL would keep Great Britain a major nation, Sir Claude Gibb, managing director of C. A. Parsons & Company, Limited, the Tyneside engineering firm, said at the annual presentation of awards early this month at the Wolverhampton and Staffordshire Technical College. Never had industry needed technical skill more, he said; the market for consumer goods from Britain was disappearing fast. It could only be in the manufacture and supply of capital goods of the highest possible efficiency and quality that Britain was going to remain a potent factor in the world. Men who graduated from technical colleges of a high standing were just as likely to go to the top in industry as men with honours degrees from universities, Sir Claude said. Mr. C. L. Old, principal of the College, said that for many years there had been growing uneasiness at the shortage of scientific and technical personnel, but the true picture was that the demands for such people had increased immeasurably and would continue to increase in the face of world competition and the changed economic situation of Great Britain.

Shell Moulding in 3D

The Shelmolda 'Áltus' will handle patterns up to 13in. in height or depth and therefore will provide a greater variety of sand/resin moulds than any other machine on the British market. All the main operations are carried out mechanically and the minimum of physical effort is required from the operator.





The Shelmolda "Altus" (patent applied for)

Capacity

Effective pattern plate sizes of 16in. by 16in. and 16in. by 12in. Handles pattern plates 13in. high or 13in. deep in each oven. Will produce from split pattern 26in. overall. Oven opening adjustable up to 16in. above or below centre line.

Operation

Semi-automatic, with everything at all times under operator's full control. Oven doors, dump box and receptor pneumatically operated. Adjustable ejector mechanism. Investment time electronically controlled. Gas or electric ovens.

May we send you further particulars?

FAIRBAIRN LAWSON COMBE BARBOUR LTD. LEEDS, ENGLAND. TELEPHONE: LEEDS 32041

AP 236-72

Personal

Mr. H. CLARKE, works manager of Qualcast, Limited, has been elected president of the Derby District Association of the Engineering and Allied Employers' National Federation.

Mr. G. F. JONES, the British Transport Commission's assistant dock manager at Barry Docks, has been appointed assistant at Cardiff, while Mr. R. EVANS, assistant to the dock manager, Cardiff Docks, becomes assistant manager at Barry. Mr. E. A. C. HOWELLS, formerly assistant to dock manager, Newport Docks, is now assistant dock manager, Newport Docks.

Mr. JAMES LEASK, one of the best-known trade union officials in the Midlands, announced on February 7 his resignation from the post he has held in the Transport and General Workers' Union, in Birmingham, for the past ten years. He is leaving the trade union movement for a position with the personnel department of Joseph Lucas, Limited, at the company's Burnley factory.

THE ANNUAL MEETING of the Chamber of Shipping of the United Kingdom will be held on February 24, and at that meeting members will be invited to accept the council's nomination of Mr. A. I. ANDERSON as their president. Mr. Anderson is chairman of the Orient Line. By his nomination as president-designate, he continues a long family tradition of service to shipping.

Mr. EDWARD NESTOR, of Brighouse, together with his wife and two young sons, sailed on the Ascania from Liverpool on February 4, for America. Mr. Nestor, who has been employed by J. Blakeborough & Sons, Limited, engineers and valve makers, of Brighouse, for 25 years and recently received a long-service award, hopes to join the business in Chicago of one of his brothers, who has been in the USA for over 40 years.

Sir HARRY PILKINGTON, chairman and managing director of Pilkington Bros., Limited, the St. Helens glass manufacturers, a director of St. Helens Collieries, Limited, and other companies, and president of the Federation of British Industries, has been appointed to the Court of the Bank of England. Lord BRAINTREE, chairman of the Crittall Manufacturing Company, Limited, metal-window manufacturers, of Braintree (Essex), who reached the age of 70 last year, is resigning from the Court with effect from February 28, and Sir Harry has been appointed for the remainder of Lord Braintree's term until February 29, 1956.

Mr. C. J. WILLIAMS has been appointed to succeed Mr. J. A. WELLINGS as manager, Casting Division, of High Duty Alloys, Limited. Mr. Wellings relinquishes the appointment on taking up his duties as director and vice-president of Canadian Steel Improvement, Limited, in Toronto. Mr. Williams joined High Duty Alloys, Limited, in 1935 and was trained as a metallurgist. In 1941, he was appointed to the position of foundry metallurgist and remained in that position until 1953, when he was made assistant manager of the Casting Division. He is this session's president of the Slough section of the Institute of British Foundrymen, and is an associate of the Institution of Metallurgists. During 1951, he visited the United States as a member of the United Kingdom Productivity Team for Zinc and Aluminium Die-casting.

THE PARSONS AND MARINE ENGINEERING TURBINE RESEARCH AND DEVELOPMENT ASSOCIATION announces that Mr. B. J. TERRELL, its senior research engineer, has been appointed to succeed the late Mr. H. G. Yates as senior designer at its Wallsend research station. Mr. Terrell will be succeeded as senior research engineer by Mr. R. F. DARLING, at present deputy senior research engineer. Mr. M. H. PETTY, at present in in charge of components testing, will succeed Mr. Darling as deputy senior research engineer. Mr. Terrell was educated at Truro Cathedral School and took a B.Sc. (Eng.) degree externally at Rugby College of Technology and Arts. He served his engineering apprenticeship in the Rugby works of the British Thomson-Houston Company, Limited. In 1938 he joined the English Electric Company, Limited, as an assistant steam turbine design engineer. He joined the staff of Pametrada in 1946, and has been senior research engineer since 1950.

A MAN who has 52 years' unbroken service with F. H. Lloyd & Company, Limited, Wednesbury, and whose family's service to the company totals more than 400 years, retired on January 28. He is Mr. Henry Joseph Ray, of Walsall, who has been a supervisor since 1940, and previously was a steel dresser, and began work at Lloyds in 1903, at the age of 13. He was presented with a cuckoo clock by the welders and a Westminster chime clock by the foremen and supervisors, at their annual dinner on January 29. In 1953, he received a gold watch from the management to commemorate his 50 years' service. In 1949, Mr. Ray went with a productivity team to America, and toured all the major steel foundries of the Middle West. In 1914, when the pneumatic hammer was introduced into foundries, Mr. Ray was the first to use one of these—now commonplace—inventions. He also helped in the construction of, and taught people how to use, the Hydroblast plant.

Obituary

Mr. LAWRENCE COLLINGWOOD WILLIAMSON, who died on February 7, at the age of 68, was formerly Deputy Director of Naval Construction at the Admiralty.

The death has occurred of Mr. MALCOLM E. F. CREALOCK, deputy chairman of Hick, Hargreaves & Company, Limited, engineers and ironfounders, of Bolton (Lancs), who was also on the boards of other companies.

Mr. WILLIAM ANTHONY HOMER, who has died at the age of 81, was chairman of Anderson & Homer, Limited, ironfounders, of Walsall (Staffs). He became governing director when the firm became a limited company in 1945.

Mr. JAMES C. JUNOR, formerly shipyard manager of R. & W. Hawthorn, Leslie & Company, Limited, Hebburn-on-Tyne, has died at the age of 79. He joined the company in 1890, was head iron foreman before becoming yard manager, and retired 17 years ago.

Mr. FREDERICK RICHARD PARTRIDGE, who for 25 years until his retirement at the end of last year was secretary of the Kettering Iron & Coal Company, Limited, died on February 3. He joined the company in 1908, became secretary in 1929, and remained a director when he resigned the secretaryship.

THE DEATH is announced of Mr. S. T. PRICE, a former works manager of W. G. Bagnall, Limited, locomotive builders, of Stafford. He was 93. Mr. Price joined Mr. W. G. Bagnall in 1875 when the first locomotive was being built at Castle Engine Works. The business was later formed into a limited company and eventually Mr. Price was appointed works manager, a position which he held until he left the employment of the company in 1915, after 40 years' service. He will be remembered particularly as the inventor and patentee of the Bagnall-Price locomotive valve gear.

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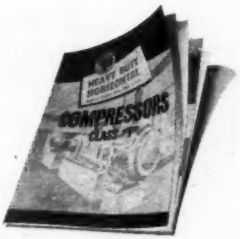

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To secure complete reliability with little or no attention is one of the principal aims in choosing a compressed air plant for permanent installation. This means a slow speed machine, such as one of the Class T range made by Consolidated Pneumatic. These horizontal water-cooled compressors, quietly running at 275 r.p.m., are built as single stage or two-stage units, in a variety of capacities and pressures. The example illustrated, delivers 500 cu.ft. per minute at 100-lb. working pressure. For constant power for years and years with negligible attention Class T compressors merit serious consideration.

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Company News

N. HINGLEY & SONS, LIMITED, ironmasters, of Netherton, Dudley (Worcs)—Subject to Treasury approval, it is proposed to issue for cash 200,000 10s. shares by way of rights to stockholders on a one-for-four basis. The price will be fixed later. After that, £1,000,000 of reserves are to be capitalized for an issue of 2,000,000 10s. shares on a two-for-one basis to stockholders registered after completion of the cash issue.

CHAMBERLIN & HILL, LIMITED, ironfounders, of Walsall (Staffs)—The board proposes that £45,000 from general reserve should be capitalized and applied in paying up 180,000 ordinary shares of 5s. each to be distributed to ordinary shareholders on the basis of one new share for each ordinary share held on February 26. An extra-ordinary meeting will be held on February 28. It is intended to issue renounceable letters of allotment as soon as possible after the meeting.

THOS. FIRTH & JOHN BROWN, LIMITED—A group profit of £1,901,528 for the 52 weeks ended October 2 is reported, against £1,996,261 for the previous 53 weeks. This is arrived at after charging £313,096 (£293,523) for depreciation and £248,500 (£253,500) for additional depreciation towards the increased cost of replacing fixed assets. With investment income of £192.362 (£166,030), profits before tax amount to £2,093,890, against £2,162,291. Tax requires £1,309,254 (£1,580,861).

J. & E. HALL, LIMITED, engineers and ironfounders, of Dartford (Kent)—A final dividend of 10 per cent. is recommended on the increased £1,008,000 ordinary stock. With the paid 2½ per cent. interim on £672,000 before the 50 per cent. free issue, the total for the year to September 30 last is equivalent to 11¼ per cent. on the present equity. This compares with 15 per cent. paid on the former capital for 1952-53, equal to 10 per cent. on £1,008.000. Trading profits decreased from £626,895 to £609,387.

GLOUCESTER RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—Arrangements have been made by the directors to issue privately to the Prudential Assurance Company 300,000 5 per cent. £1 redeemable cumulative preference shares at par. Treasury consent for the issue has already been obtained. Schemes of expansion and modernization will require about £265.000, it is stated, and more working capital will be needed. The issue of 300,000 5 per cent. preference will provide the bulk of the money required. An extra-ordinary meeting will be held in London on February 25.

ENGLISH CHINA CLAYS, LIMITED—A final dividend of 6½ per cent., tax free, makes an 8½ per cent. net distribution for the year to September 30 on an ordinary capital increased to £2,318,891 during the year. For 1952-53 shareholders received a total of 6¾ per cent., tax free, on the smaller capital. Group net profits expanded from £462,793 to £1,109,089, but the 1953-54 figure includes unrequired tax provisions and recoveries amounting to £190.622. The subsidiary, English Clays Lovering Pochin & Company, Limited, is raising its tax-free dividend from 6 per cent. to 7½ per cent. for the year to September 30, with a final dividend of 5½ per cent. The group profit of £1,116,006 compares with £467,227 and is struck after all charges.

Recent Wills

MOOR, T. M. H., formerly commercial manager of Chesterfield Tube Company, Limited £138,407

TWEEDALE, ERNEST, formerly managing director of Tweedales & Smalley (1920), Limited, textile machinery manufacturers, of Castleton, Rochdale, and a founder of Whipp & Bourne, Limited, manufacturing electrical engineers, of Castleton ... £80,886

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference BSB can be obtained from the Board of Trade, Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone CHAncery 4411, ext. 738 or 771), unless otherwise stated.

ARNOLD (NOTTS), February 28—Cast-iron manhole covers and road gully frames, etc., for the 12 months ending March 31, 1956, for the Urban District Council. The Engineer and Surveyor, Arnot Hill House, Arnold.

BELGIAN CONGO, March 4—Metal door and window frames, for the Service des Approvisionnements du Ministère des Colonies, Brussels. (BSB/2525/55.)

BROWNHILLS (STAFFS), February 21—Cast-iron manhole covers and frames and gully grates and frames, for the year ending March 31, 1956, for the Urban District Council. Mr. Charles H. Hunt, the council's engineer and surveyor, Coombe House, Brownhills.

CHESTER-LE-STREET (CO. DURHAM), March 2—Manhole covers, step-irons, gully frames, and inspection chamber covers, for the 12 months ending March 31, 1956, for the Rural District Council. Mr. W. Hughes, surveyor, Union Offices, Chester-le-Street.

DEWSBURY (YORKS), March 3—Cast-iron pipes and specials, cast-iron surface boxes, etc., for the year ending March 31, 1956, for the Borough Council. The Water Engineer, 10, Church Street, Dewsbury.

DURHAM, February 26—Spun-iron straight pipes, spun-iron straight pipes with screwed gland joints, standard cast-iron specials, iron castings, etc., for the 12 months from April 1, for the Water Board. Mr. Charles Gibson, clerk to the board, 43, Old Elvet, Durham.

FARNWORTH (LANCS), February 19—Cast-iron gully grids and frames and manhole covers, for the year ending March 31, 1956, for the Town Council. The Borough Engineer and Surveyor, Town Hall, Farnworth.

LANCASTER, February 25—Iron water pipes and special castings, manhole covers, and gully gratings, for the 12 months commencing April 1, 1955, for the City Highways Committee. The City Engineer, Town Hall, Lancaster.

NORTHWICH (CHES), February 23—Sewerage ironwork, spun and cast-iron pipes, for the Rural District Council. Mr. J. B. Birtwistle, engineer and surveyor, Whitehall, Hartford, Northwich. (Deposit, £1 1s.)

PAKISTAN, March 16—Equipment for the Gilgit hydro-electric project, for the Director General of Supply and Development, Government of Pakistan. (BSB/2557/55.)

READING, February 18—Cast-iron manhole covers, gullies, and frames for the year ending March 31, 1956, for Berkshire County Council. The County Surveyor, Shire Hall, Reading.

SOUTH SHIELDS, February 24—Cast-iron gullies and manholes, iron and steel, flies, bolts, and nuts, etc., for the 12 months commencing April 1, for the Town Council. The Town Clerk, Town Hall, South Shields.

Third Generation

With the appointment of Mr. Mark Robin Balfour as a director of Arthur Balfour & Company, Limited, the Sheffield steelmaking concern, the family's third generation is now represented on the board. Mr. Balfour, who is 27, is the grandson of Lord Riverdale, chairman of the company, and the son of Mr. R. A. Balfour, the managing director. Educated at Trinity College, Port Hope, Canada, he joined the family business at the end of the war, following service in the Royal Navy. He has been a director of the firm's subsidiary, C. Meadows & Company, Limited, steel rollers and forgers, of Sheffield, for some time.

The appointment to the board of Mr. Lawrence Wright, who has been with the company for 40 years, is also announced. Mr. Wright was in charge of the Far Eastern interests of Arthur Balfour & Company for some years, having joined the firm when he was about 15.

IN A LECTURE which Mr. P. Rigaut gave to the *Association Technique de Fonderie*, he announced the formation by the Industrie Mechanique of a select committee on the quality of castings. This committee will ascertain what steps can be taken to bring about useful co-operation between founder and designer.

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FS 14

Raw Material Markets

Iron and Steel

The South Durham Steel & Iron Company, which already has a new blast furnace in course of construction at its West Hartlepool works, has decided to build yet another with a 22-ft. 6-in. hearth diameter to replace an existing 16-ft. furnace. The new scheme also embraces the installation of a new sinter plant and a battery of modern coke ovens. These, of course, are necessarily long-term developments which cannot affect the volume of immediate supplies. More pig-iron is urgently needed for the steelworks and for the foundries also, and to bridge the gap endeavours are being made to purchase supplementary tonnages of foreign manufacture. Some of the foundries have now very slender stocks.

No section of the trade is being more severely incommoded by shortage of raw materials than the engineering and speciality foundries, whose supplies of the low- and medium-phosphorus irons fall far short of present requirements. Prospects are bleak, as there appears at present no possibility of an improvement in outputs; in fact, the opposite is envisaged. It is with difficulty that the foundries obtain alternative grades of pig-iron to make good the shortage, although these alternatives entail much higher prices.

Hematite, after the needs of the steelworks have been met, is very scarce in some brands, and many refined-iron makers are covered for their outputs for some weeks ahead. Although users have tried all possible sources for supplies of home-produced iron they have failed to obtain satisfactory tonnages, and it is learnt that some establishments have booked quantities of imported low-phosphorus iron in order to ensure continuity of production. Supplies of imported irons are none too plentiful, as there is also a strong overseas demand.

The light, textile, and jobbing foundries have sufficient work on hand to absorb all available supplies of high-phosphorus pig-iron and many of them are anxious to obtain larger tonnages when they become available.

Scrap is none too plentiful; in some areas there is a dearth of supply of heavy cast iron and machinery scrap. Ganister, limestone, and firebricks are received to requirements, and deliveries of foundry coke are coming forward fairly satisfactorily.

No improvement in the supply of steel semis to the re-rollers can be foreseen at present, and they are being seriously impeded. Many units have up to six months' work on hand, and orders are badly in arrears.

Fewer orders are being placed for heavy finished-steel products at the moment, but this is not due to lack of demand, but to the fact that few of the steelworks will accept further commitments.

Non-ferrous Metals

Quieter trading conditions were in evidence last week and in some directions a slightly easier tendency was noticeable on the London Metal Exchange, where turnovers were still well maintained. Sentiment regarding the international outlook improved somewhat and there was a tendency to believe that the situation in the Far East was more encouraging. Copper remained the chief centre of interest, for, in spite of a slowly improving situation in Northern Rhodesia, production on the Copperbelt is a long way below normal. Our dependence to a large extent on that area for supplies makes the outlook for the second quarter serious. Buyers have turned to Chile in an effort to secure much needed supplies, but it is doubtful if there is a great deal to be had from that source before the second half of the year.

In the United States the domestic price remains at 33 cents, but prices much in excess of that level are being paid by users, who are hard put to it to acquire enough metal to keep their plants fully supplied. On the Commodity Exchange the daily quotations for copper have been nearer 40 cents than 30 cents, but trading has not been very active. So far the US Government has not agreed to any releases from the stockpile.

Last week saw a good turnover on the copper market in London, but initially there was quite a sharp setback. It was followed, however, by a recovery, which by Friday had lifted the quotation well above £360. Eventually, the price sagged somewhat and the week closed with cash £4 up, at £360, but three months gained £12 10s., at £343 10s., bringing the backwardation, which had been the previous Friday as wide as £25, to £16 10s.

Zinc was unchanged for prompt, but 15s. down forward, while lead, closing level at £104 10s., lost 30s. for February and 25s. for May. Movements in the tin market reflected the better reaction to the Far Eastern situation, for cash lost £9 10s., while three months was down £8 10s.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* February 10, £360 to £361; February 11, £360 to £361; February 14, £352 10s. to £355; February 15, £347 10s. to £350; February 16, £335 to £337 10s.

Three Months: February 10, £343 to £343 10s.; February 11, £343 to £344; February 14, £336 to £337; February 15, £355 to £336; February 16, £321 to £322.

TIN, Standard—*Cash:* February 10, £715 to £716; February 11, £718 to £719; February 14, £713 to £714; February 15, £712 to £713; February 16, £710 to £711.

Three Months: February 10, £717 10s. to £718; February 11, £720 to £721; February 14, £716 to £716 10s.; February 15, £715 to £715 10s.; February 16, £712 10s. to £713.

ZINC—*First half February:* February 10, £91 to £91 10s.; February 11, £91 5s. to £91 15s.; February 14, £90 15s. to £91 5s.; February 15, £89 15s. to £90. *Second half February:* February 16, £88 10s. to £88 15s.

First half May: February 10, £88 5s. to £88 10s.; February 11, £88 5s. to £88 10s.; February 14, £87 15s. to £88; February 15, £87 10s. to £87 15s. *Second half May:* February 16, £86 10s. to £86 15s.

LEAD—*First half February:* February 10, £104 10s. to £104 15s.; February 11, £104 5s. to £104 10s.; February 14, £102 15s. to £103; February 15, £102 15s. to £103. *Second half February:* February 16, £102 5s. to £102 10s.

First half May: February 10, £104 10s. to £104 15s.; February 11, £104 5s. to £104 10s.; February 14, £103 to £103 5s.; February 15, £102 15s. to £103. *Second half May:* February 16, £102 to £102 5s.

Increases in Capital

COVENTRY ART CASTINGS COMPANY, LIMITED, increased by £10,000, in £1 shares, beyond the registered capital of £5,000.

METALLURGICAL ENGINEERS, LIMITED, London, E.C.4, increased by £9,000, in £1 ordinary shares, beyond the registered capital of £5,000.

AJAX ENGINEERING COMPANY (BIRMINGHAM), LIMITED, increased by £10,000, in £1 ordinary shares, beyond the registered capital of £5,000.

YOUNG, AUSTIN & YOUNG, LIMITED, heating and general engineers, etc., of Leicester, increased by £35,000, in 5s. ordinary shares, beyond the registered capital of £96,000.

S. RHODES & COMPANY, LIMITED, iron and steel merchants, dealers in scrap metals, etc., of Sheffield, increased by £15,000, in £1 ordinary shares, beyond the registered capital of £40,000.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

February 16, 1955

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £15 12s. 0d.; Birmingham, £15 5s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £17 13s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £18 9s. 3d.

Scotch Iron.—No. 3 foundry, £18 2s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £20 4s. 0d.; South Zone, £20 6s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £21 1s. 6d.; South Zone, £21 4s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £18 2s. 6d.; Scotland (Scotch iron), £18 9s. 0d.; Sheffield, £19 7s. 6d.; Birmingham, £19 14s. 6d.; Wales (Welsh iron), £18 9s. 0d.

Basic Pig-iron.—£15 15s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots).—40/55 per cent., £40 15s. 0d., basis 45 per cent. Si, scale 15s. per unit; 70/84 per cent., £63 0s. 0d., basis 75 per cent. Si, scale 16s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 11s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £170 0s. 0d. to £174 0s. 0d. per ton; 38/40 per cent., £264 0s. 0d. to £268 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 17s. 7d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 20s. 7d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £78 0s. 0d. to £80 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £76 0s. 0d. to £78 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; 2 per cent. C,* 1s. 8½d. per lb. Cr; 1 per cent. C,* 1s. 9d. per lb. Cr; 0.15 per cent. C,* 1s. 10½d. per lb. Cr; 0.10 per cent. C,* 1s. 10¾d. per lb. Cr; 0.06 per cent. C,* 1s. 11d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 6½d. to 7s. 1d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £255 0s. 0d. to £262 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £54 15s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 5s. 0d.; tested, 0.08 to 0.25 per cent. C, £26 5s. 0d.; hard (0.41 to 0.60 per cent. C), £27 10s. 0d.; silico-manganese, £34 10s. 0d.; free-cutting, £29 6s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 17s. 0d.; silico-manganese, £34 10s. 0d.

* Average 68-70 per cent. Cr.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 15s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £31 1s. 6d.; boiler plates (N.-E. Coast), £33 11s. 6d.; floor plates (N.-E. Coast), £32 10s. 6d.; sectional material, N.-E. Coast, £29 4s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 19s. 6d.; flats, 5 in. wide and under, £31 19s. 6d.; hoop and strip, £33 1s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £34 5s. 0d.; black sheets (hand mill), 17/20 g., £43 13s. 6d.; galvanized corrugated sheets, 24 g., £54 17s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £54 7s. 9d.; nickel-chrome, £76 7s. 9d.; nickel-chrome-molybdenum, £86 8s. 6d.

NON-FERROUS METALS

Copper.—Cash, £335 0s. 0d. to £337 10s. 0d.; three months, £321 0s. 0d. to £322 0s. 0d.; settlement, £337 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 3s. 4⁵d. per lb.; wire, 396s. 3d. per cwt. basis; 20 s.w.g., 427s. 6d. per cwt.

Tin.—Cash, £710 0s. 0d. to £711 0s. 0d.; three months, £712 10s. 0d. to £713 0s. 0d.; settlement, £711 0s. 0d.

Zinc.—Second half February, £88 10s. 0d. to £88 15s. 0d.; second half May, £86 10s. 0d. to £86 15s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £121 10s. 0d.; rolled zinc (boiler plates), all English destinations, £119 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £103 0s. 0d.

Lead (Refined Pig).—Second half February, £102 5s. 0d. to £102 10s. 0d.; second half May, £102 0s. 0d. to £102 5s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 8½d. per lb.; rods, drawn, 3s. 5½d.; sheets to 10 w.g., 342s. per cwt.; wire, 3s. 3d.; rolled metal, 328s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £221; B6 (85/15), £300; BS249, £250.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £260; HTB2 (38 tons), £274; HTB3 (48 tons), £285.

Gunmetal.—RCH, 3/4 per cent. tin, —; BS1400, LG2 (85/5/5/5), £294; LG3 (86/7/5/2), £306; G1 (88/10/2/¼), £380; (88/10/2/1), £371.

Phosphor Bronze.—BS1400, PB1 (AID released), £395 per ton.

Phosphor Bronze Strip, etc.—Strip, 478s. 9d. per cwt.; sheets to 10 w.g., 501s. 3d. per cwt.; wire, 4s. 10d. per lb.; rods, 4s. 3d.; tubes, 4s. 1½d.; chill cast bars: solids 4s. 3½d., cored 4s. 4½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 4s. 0½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 5½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 4½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £108 10s. 0d. to £110 0s. 0d. Nickel, £519 0s. 0d. Aluminium, ingots, £163 0s. 0d.; aluminium bronze (BS1400), AB1, £336; AB2, £350. Solder, brazing, BS1845, 2s. 6d. lb.; granulated, 2s. 9d. lb.